PRELIMINARY INVESTMENT ROADMAP: REGULATORY AND FINANCIAL REVIEW

November 2025

Prepared by:

Power Engineering Consulting Joint Stock Company 1

PROJECT

PRELIMINARY STUDY FOR DEVELOPMENT OF CLEAN ENERGY COMPLEX IN KHANH HOA PROVINCE, VIETNAM

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No.: 12.2025-UNOPS/PVP-LS-CEC-PD-PIR-002

VIETNAM ELECTRICITY

POWER ENGINEERING CONSULTING JOINT STOCK COMPANY 1

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Hanoi, November 28, 2025

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PRELIMINARY INVESTMENT ROADMAP: REGULATORY AND FINANCIAL REVIEW

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Subject: **Preliminary Investment Roadmap: Regulatory and Financial Review**

Comment: This Report includes following key items (1) Introduction comprises objectives, scope of work, and background of the package; (2) Regulatory compliance assessment to align with Revised Power Development Plan VIII; (3) Financial analysis and identify potential funding sources; and (4) Preliminary investment roadmap and financial projections for the project.

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TABLE OF CONTENTS

ABBREVIATIONS

AEP	Annual Energy Production
B/C	Benefit to Cost ratio
DC	Document Controller
DPM	Deputy Project Manager
E_0	Long term annual generation
EIRR	Economic Internal Rate of Return
EM	Engineering Management
ETP	The Southeast Asia Energy Transition Partnership
ESIA	Environmental and Social Impact Assessment
EVN	Vietnam Electricity
FIRR	Financial Internal Rate of Return
FS	Feasibility Study
GIS	Geographic Information Systems
GWh	Gigawatt hour
IEC	International Electro-technical Commission
ISO	International Organization for Standardization
JSC	Joint Stock Company
MW	Megawatt
MOIT	The Ministry of Industry and Trade
NPV	Net Present Value
O&M	Operation and Maintenance
PD	Project Director
PDP VIII	National Electricity Development Plan 2021 to 2030, with a vision to 2050
PE	Project Engineering
PECC1	Power Engineering Consulting Joint Stock Company 1
PM	Project Manager
PV Power	Petrovietnam Power Corporation
RE	Renewable Energy
SDGs	The UN's Sustainable Development Goals
TOR	Term of Reference
UNOPS	The United Nations Office for Project Services

EXECUTIVE SUMMARY

This report presents the results of Task 2 - Preliminary Investment Roadmap: Regulatory and Financial Review under the Preliminary Study for Development of the Lam Son Clean Energy Complex in Khanh Hoa Province, Vietnam. The study was prepared by Power Engineering Consulting Joint Stock Company 1 (PECC1) for UNOPS and PV Power to support early-stage investment decision-making and risk mitigation for a large-scale integrated clean energy project.

The Lam Son Clean Energy Complex is conceived as a hybrid generation and storage system, combining utility-scale solar power with pumped-storage hydropower (PSH) and battery energy storage systems (BESS). The project is designed to enhance system flexibility, reduce curtailment risks, and contribute to Vietnam's long-term decarbonization objectives, including the national commitment to achieve net-zero emissions by 2050.

Regulatory and Planning Assessment

The regulatory review confirms that power project development in Vietnam is governed by a comprehensive legal framework covering planning, investment, land use, electricity, environment, and taxation. Under current legislation, any new power project must be consistent with the National Power Development Plan VIII (revised PDP VIII) and relevant provincial development plans, and investor selection is generally subject to competitive bidding, with limited statutory exceptions.

The Lam Son project is not currently listed in either the revised PDP VIII or the approved development plans of the former Ninh Thuan Province. However, the analysis identifies material planning headroom and strategic justification for its potential inclusion in future plan updates. In particular:

- Revised PDP VIII projects a rapid expansion of solar and energy storage capacity, with 5.9-32.9 GW of unallocated solar capacity by 2030, depending on scenario assumptions.
- Implementation risks facing LNG and offshore wind projects-including long development timelines, high costs, and unresolved commercial frameworks-create a near-term supply gap that hybrid renewable-storage projects could help address.
- Politburo Resolution No. 70-NQ/TW sets more ambitious capacity targets (up to 236 GW by 2030), implying that additional generation projects beyond current PDP VIII allocations will be required.

Against this backdrop, the Lam Son Clean Energy Complex is assessed as strategically aligned with national energy security objectives and well positioned for consideration in forthcoming updates to PDP VIII and the socio-economic development

plan of the newly consolidated Khanh Hoa Province. Over its lifetime, the project is estimated to reduce approximately 2.95 million tons of CO_2 emissions annually, contributing meaningfully to Vietnam's power-sector decarbonization targets.

Financial and Market Assessment

The report evaluates Vietnam's evolving electricity market structure, including the wholesale electricity market (VWEM), competitive bidding mechanisms, and emerging Direct Power Purchase Agreement (DPPA) frameworks. While no precedent yet exists for a fully integrated Solar-PSH-BESS complex, several commercially viable offtake pathways are identified, including power purchase agreements with EVN, participation in the wholesale market, DPPA arrangements with large consumers, and provision of ancillary services enabled by storage assets.

Preliminary financial analysis indicates that the project is economically and financially viable under reasonable assumptions. For the base financing case-20% equity, domestic commercial loans at 10% interest, and foreign-currency equipment loans at approximately 7% interest-the project achieves:

- A levelized cost of energy (LCOE) of 8.47 USc/kWh,
- A target tariff of 10.06 USc/kWh corresponding to a Financial Internal Rate of Return (FIRR) of 12%, in line with prevailing regulatory constraints.

Sensitivity analysis shows that the project remains viable under adverse conditions, including a 10% increase in capital costs or a 10% reduction in revenues.

Preliminary Investment Roadmap and Risks

A five-stage investment roadmap is proposed, covering investment preparation, project development, construction, operation and maintenance, and eventual decommissioning. The indicative schedule anticipates approximately three years for pre-construction activities, followed by phased construction that allows partial solar generation prior to full commissioning of the pumped-storage component.

Key investment risks-relating to permitting, grid connection, construction scheduling, financing conditions, and regulatory uncertainty-are assessed as low to medium, with mitigation measures identified for each category.

Conclusion

Overall, this report concludes that the Lam Son Clean Energy Complex is technically feasible, financially bankable, and strategically relevant within Vietnam's evolving power system. While formal inclusion in national and provincial plans remains a prerequisite for implementation, the findings of this Task 2 study provide a robust analytical foundation for subsequent technical design, stakeholder consultation, and government endorsement activities under the next phases of the project.

1. INTRODUCTION

The Lam Son Clean Energy Complex project in Khanh Hoa Province is a strategic initiative to advance Vietnam's net-zero emissions goal by 2050, focusing on de-risking investments in renewable energy infrastructure. This project will support the development of clean energy, with an initial estimate of 3,500 MWp of solar PV, 1,440 MW of pumped storage hydropower, and 350 MW of battery storage systems. In order to assess its viability and development process there is a need for the following:

- Preliminary Environmental and Social Impact Assessment,
- Preparing Preliminary Engineering Specifications, and
- Drafting an Initial Investment Report.

As the consultant for this stage of development the Power Engineering Consulting Joint Stock Company 1 (PECC1) divides 06 major Tasks to be implemented as follow:

Task 1	Initiation and Data Collection Report
Task 2	Preliminary Investment Roadmap: Regulatory and Financial Review
Task 3	Preliminary Technical Design and Risk Analysis
Task 4	Stakeholder Consultations and Preliminary Design Review
Task 5	Finalization of Study and Reports
Task 6	Government Endorsement

This report is the outcome of Task 2: Preliminary Investment Roadmap: Regulatory and Financial Review. This task covers the following topics:

- Regulatory compliance assessment to align with Revised Power Development Plan VIII.
- Financial analysis and identify potential funding sources.
- Preliminary investment roadmap and financial projections for the project.

Details will be shown in the following sections.

2. REGULATORY COMPLIANCE ASSESSMENT

2.1. Assessment of compliance with institutional frameworks related to power project development

2.1.1. *Related laws and legislations*

The highest order of legislation in Vietnam is the Constitution. Below there are related laws and regulations for development of power project, which are listed in following tables.

Table 2-1: Major legislations related to Planning

No.	Number of legislations	Name of legislation	Issued by
1.	Law No. 21/2017/QH14	Law on Planning	National Assembly
2.	Decree No. 37/2019/NĐ-CP	Detail regulations for a number of articles of the Law on Planning	Government
3.	Decree No. 58/2023/ND-CP	Amending and supplementing a number of articles of Decree No. 37/2019/ND-CP dated May 7, 2019 of the Government detailing a number of articles of the Law on Planning	Government
4.	Decree No. 22/2025/NĐ-CP	Amending and supplementing a number of articles of Decree No. 37/2019/ND-CP dated May 7, 2019 of the Government detailing the implementation of a number of articles of the Law on Planning, which has been amended and supplemented by a number of articles under Decree No. 58/2023/ND-CP dated August 12, 2023 of the Government	Government

Table 2-2: Important legislations related to power electricity

No.	Number of legislations	Name of legislation	Issued by
1.	Law No. 61/2024/QH15	Law on Electricity	National Assembly
2.	Decree No. 18/2025/NĐ-CP	Detail regulations for a number of articles of the Law on Electricity related to Power purchase and situations for power supply insurance	Government
3.	Decree No. 56/2025/NĐ-CP	Detail regulations for a number of articles of the Law on Electricity on Power Development Plan, supply grid development plan, construction investment for electrical projects, auction for investor selection of electric business projects.	Government
4.	Decree No. 57/2025/NĐ-CP	Regulations on Direct Power Purchase Mechanism between renewable energy generation units and major electric user	Government
5.	Decree No. 58/2025/NĐ-CP	Detail regulations for a number of articles of the Law on Electricity on Development of Renewable Electric Power, New Power	Government

No.	Number of legislations	Name of legislation	Issued by
6.	Decree No. 61/2025/NĐ-CP	Detail regulations for a number of articles of the Law on Electricity on Permits for Electricity Activities	Government
7.	Decree No. 62/2025/NĐ-CP	Detail regulations for a number of articles of the Law on Electricity on Protection of Electricity Projects and Safety in Electricity Sectors	Government
8.	Decree No. 72/2025/NĐ-CP	Regulations on mechanism, period for revision of average retail electricity tariff	Government
9.	Circular No. 02/2025/TT-BCT	Regulations on Protection of Electricity Projects and Safety in Electricity Sectors	Ministry of Industry and Trade
10.	Circular No. 03/2025/TT-BCT	Regulations on dossiers, sequence and procedure for power purchase with for foreign countries	Ministry of Industry and Trade
11.	Circular No. 04/2025/TT-BCT	Regulations on sequence of stoppage, reductions of power supply level	Ministry of Industry and Trade
12.	Circular No. 05/2025/TT-BCT	Regulations on systems for power electric transmission, distribution and metering	Ministry of Industry and Trade
13.	Circular No. 06/2025/TT-BCT	Regulations on dispatching, operation, control, troubleshooting, black start, and restoration of the national power system	Ministry of Industry and Trade
14.	Circular No. 07/2025/TT-BCT	Regulations on demand management	Ministry of Industry and Trade
15.	Circular No. 08/2025/TT-BCT	Regulations on electricity generation costs of power plants during the period before participating in the competitive electricity market for certain types of power plants.	Ministry of Industry and Trade
16.	Circular No. 09/2025/ TT-BCT	Regulations on dossiers, procedures, methods for determining and approving the electricity generation price framework; regulations on dossiers, procedures for developing and approving the electricity import tariff ceiling	Ministry of Industry and Trade
17.	Circular No. 10/2025/TT-BCT	Regulations on the method of determination and principles for applying the avoided cost tariff for small renewable energy power plants; main contents of the power purchase agreement.	Ministry of Industry and Trade
18.	Circular No. 11/2025/TT-BCT	Regulations on the method for determining and the procedures for approving the prices of ancillary services in the power system; main contents of the ancillary service provision contract in the power system	Ministry of Industry and Trade
19.	Circular No. 12/2025/TT-BCT	Regulations on the method for determining the price of electricity generation services; principles for electricity pricing in the implementation of power projects; main contents of the power purchase agreement	Ministry of Industry and Trade

No.	Number of legislations	Name of legislation	Issued by
20.	Circular No. 13/2025/TT-BCT	Regulations on determining the electricity payment amount in cases where metering equipment is inaccurate, stops operating, or is lost	Ministry of Industry and Trade
21.	Circular No. 03/2025/TT-BTNMT	Detailed regulations on the scope of basic investigations into renewable energy and new energy power resources within the territory of Vietnam	Ministry of Agriculture and Environment
22.	Circular No. 14/2025/TT-BCT	Regulations on the method of formulation, documentation, order, and procedures for approving electricity transmission service prices	Ministry of Industry and Trade
23.	Circular No. 15/2025/TT-BCT	Regulations on the methods for preparing, documenting, and the procedures for approving the prices of power system operation scheduling services and electricity market transaction operation services	Ministry of Industry and Trade
24.	Circular No. 16/2025/TT-BCT	Regulations on the operation of the competitive wholesale electricity market (abbreviated as the electricity market) including the following main contents: registration for participation in the electricity market; electricity market operation planning; bidding mechanisms; scheduling and dispatch mechanisms	Ministry of Industry and Trade
25.	Circular No. 17/2025/TT-BCT	Regulations on the method of formulation and the order and procedures for approving the wholesale electricity price framework; methods for determining wholesale electricity prices; main contents of the wholesale electricity sale contract.	Ministry of Industry and Trade
26.	Decision No. 988/QĐ-BCT dated April 10, 2025	Approval of Ceiling tariff applied for solar farm type in 2025	Ministry of Industry and Trade
27.	Decision No. 1198/QĐ-BCT	Approval of Ceiling tariff applied for pumped storage type in 2025	Ministry of Industry and Trade

Table 2-3: Major legislation related to investment

No.	Number of legislation	Name of legislation	Issued by
1.	Law No. 61/2020/QH14	Law on Investment	National Assembly
2.	Law No. 64/2020/QH14	Law on Investment in the Form of Public-Private Partnership	National Assembly
3.	Law No. 58/2024/QH15	Law on Public Investment	National Assembly
4.	Decree No. 31/2021/NĐ-CP	Detailed provisions and guidance on the implementation of certain articles of the Law on Investment.	Government
5.	Decree No. 85/2025/NĐ-CP	Detailed provisions for the implementation of certain articles of the Law on Public Investment	Government

No.	Number of legislation	Name of legislation	Issued by
6.	Decree No. 35/2021/NĐ-CP	Detailed Regulations and Guidelines for the Implementation of the Law on Public-Private Partnership Investment	Government
7.	Decree No. 71/2025/NĐ-CP	Amendments and Supplements to a Number of Articles of the Government's Decree No. 35/2021/ND-CP dated March 29, 2021, Detailing and Guiding the Implementation of the Law on Investment in the Form of Public-Private Partnership	Government
8.	Decree No. 85/2025/NĐ-CP	Detailed Provisions for the Implementation of Certain Articles of the Law on Public Investment	Government
9.	Decree No. 225/2025/NĐ-CP	Amendments and Supplements to Certain Articles of the Decrees Detailing a Number of Articles and Implementation Measures of the Law on Bidding Regarding Investor Selection	Government

Table 2-4: Major legislation related to corporate taxes

No.	Number of legislation	Name of legislation	Issued by
1.	Law No. 13/2008/QH12	Law on Value-Added-Tax	National Assembly
2.	Law No. 14/2008/QH12	Law on Corporate Income Tax	National Assembly
3.	Law No. 45/2009/QH12	Law on Tax for Natural Resources	National Assembly
	Law No. 48/2010/QH12	Law on Non-Agricultural Land Use Tax	National Assembly
4.	Law No. 57/2010/QH12	Law on Tax for Environmental Protection	National Assembly
5.	Law No. 31/2013/QH13	Law on Amending and Supplementing a Number of Articles of the Law on Value-Added-Tax	National Assembly
6.	Law No. 32/2013/QH13	Law on Amending and Supplementing a Number of Articles of the Law on Corporate Income Tax	National Assembly
7.	Law No. 71/2014/QH13	Law on Amendments and Supplements to Certain Articles of Tax Laws	National Assembly
8.	Law No. 106/2016/QH13	Law on Amendments and Supplements to a Number of Articles of the Law on Value-Added Tax, the Law on Special Consumption Tax, and the Law on Tax Administration	National Assembly
9.	Law No. 107/2016/QH13	Law on Import and Export Tariff	National Assembly
10.	Law No. 03/2022/QH15	Law on Amendments and Supplements to a Number of Articles of the Law on Public Investment, the Law on Investment in the Form of Public-Private Partnership, the Law	National Assembly

No.	Number of legislation	Name of legislation	Issued by
		on Investment, the Law on Housing, the Law on Bidding, the Law on Electricity, the Law on Enterprises, the Law on Special Consumption Tax, and the Law on Civil Judgment Enforcement	
11.	Decrees No. 181/2025/NĐ-CP	Detailed Provisions for the Implementation of Certain Articles of the Law on Value-Added Tax	Government

Table 2-5: Other relevant laws and regulations

No.	Number of legislation	Name of legislation	Issued by
1.	Law No. 16/2017/QH14	Law on Forestry	National Assembly
2.	Law No. 72/2020/QH14	Law on Environmental Protection	National Assembly
3.	Law No. 31/2024/QH15	Law on Land	National Assembly
4.	Law No. 28/2023/QH15	Law on Water Resources	National Assembly
5.	Law No. 55/2024/QH15	Law on Fire Prevention and Fighting and Rescue Operations	National Assembly
6.	Decree No. 08/2022/NĐ-CP	Detailing the implementation of certain provisions of the Law on Environmental Protection	Government
7.	Decree No. 156/2018/ND-CP	Detailing the implementation of certain provisions of the Law on Forestry	Government
8.	Decree No. 27/2024/NĐ-CP	Amendments and Supplements to Certain Articles of Decree No. 156/2018/ND-CP dated November 16, 2018 of the Government, detailing the implementation of certain provisions of the Law on Forestry	Government
9.	Decree No. 53/2024/NĐ-CP	Detailing the Implementation of Certain Provisions of the Law on Water Resources	Government
10.	Decree No. 71/2024/NĐ-CP	Regulation on Land Prices	Government
11.	Decree No. 102/2024/NĐ-CP	Detailed Regulations for the Implementation of Certain Articles of the Land Law	Government
12.	Decree No. 05/2025/NĐ-CP	Amending and Supplementing Certain Articles of Decree No. 08/2022/NĐ-CP Dated January 10, 2022 of the Government, Detailing the Implementation of Certain Provisions of the Law on Environmental Protection	Government
13.	Decree No. 105/2025/NĐ-CP	Detailed Provisions and Measures for the Implementation of the Law on Fire Prevention and Fighting and Rescue Operations	Government

No.	Number of legislation	Name of legislation	Issued by
14.	Decree No. 226/2025/NĐ-CP	Amending and supplementing certain provisions of the decrees detailing the implementation of the Land Law	Government

Several important points are summarized below:

- For planning steps purposes legislation in Table 2-1, Electricity Law and those in Table 2-5 shall be followed. Based on the current laws and regulations any new power project shall be included in the development plans, i.e. shall be accounted for in the current National Power Development Plan and/or the Provincial Development Plan. The project shall also not interfere with other national development plans, for instance Development Plans for Forestry, for Water Resources or Planning for exploration, mining, processing, and utilization of various types of minerals.
- For investment step the legislation in Table 2-3 and the Law for Electricity will govern. The process of power project investment shall follow requirements in investment laws and their relevant guidance by the government. The developer for a new project shall be auctioned, except certain exceptions specified in the Law of Electricity. Various investment forms, such as public investment, Public-Private-Partnership (PPP), private or foreign investment, are governed by the relevant laws and legislation. The investment steps also need various permits, which are required not only in the regulations in Table 2-3, but also in Table 2-2 for electricity, and Table 2-5 for varieties of land, water, forestry, and firefighting oversight.
- The circulars and decisions in Table 2-2 provide guidance for methods of calculations for power tariff. Tax and other royalties and compensation are listed in Table 2-4 and the Decree No. 71/2024/NĐ-CP in Table 2-5, which will help for economic and financial analysis. It is important to note that the Circular No. 12/2025/TT-BCT for determining the price of electricity generation services specified that the financial internal rate of return (FIRR) shall not exceed 12%. A minimum equity ratio is 15% of the total project investment capital That will directly impact the financial models of new types of generation projects without a ceiling tariff imposed by the Government.
- One important aspect for planning compliance is the authority of changing land use purposes. After current regulation authority to decide on the policy of converting land to other purposes is summarized in the following table.

Table 2-6: Approved authority for converting land to other purposes

No.	Proposal entities	Competent authorities	Legal background
1	Household, individual	District People's Committee	Article 123 of Law on Land 2024

No.	Proposal entities	Competent authorities	Legal background
2	Organization, business	Provincial People's Committee	Article 123 of Law on Land 2024
3	Large scale conversion intent	Provincial People's Council decides on policy. Provincial People's Committee makes specific decision	Article 126 of Law on Land 2024
4	Important or national projects	The Prime Minister or the National Assembly decides on the policy	Article 126 of Law on Land 2024; Article 121 on cases requiring permission

- The government requires to use standard power purchase agreements, which are controlled in a number of circulars in Table 2-2. For technical operation various decrees and circulars in Table 2-2 will be referred.
- It is expected that the Lam Son project development will need to meet all requirements in the listed legislations, and/or any of their supplementary and revisions.

2.1.2. *Institution frameworks*

2.1.2.1. *Administrative management*

The energy sector of Vietnam is managed and controlled by the Government.

a) Ministry of Industry and Trade, MOIT

MOIT is the ministry to implement the government administration in the power sector. Its main functions include: (i) setting up law and legislative framework and policies, (ii) development planning, and (iii) implementation supervision. Helping the MOIT in management of electricity and renewable energies is the Electricity Authority of Viet Nam.

b) Electricity Authority of Viet Nam

Electricity Authority of Vietnam (EAV)' s main functions, tasks, and authorities are stipulated in Decision No. 515/QĐ-BCT dated February 28, 2025 by MOIT and summarized below[1]:

- Preparation and submit to the competent authorities the following:
  - Power development plans and implementation plans, including list of 100% stated-owned project development and operation, list of emergency projects, strategy and intend to trans-boundary power trade,
  - Mechanisms and policies for power development and tariff,
  - Development of power sector and power markets,

[1] https://thuvienphapluat.vn/van-ban/Bo-may-hanh-chinh/Quyet-dinh-515-QD-BCT-2025-nhiem-vu-quyen-han-va-co-cau-to-chuc-cua-Cuc-Dien-luc-645144.aspx

- Regulations for grid operation and metering,
- Permit regulations,
- Fine regulations.

- Establishment of technical standards and regulations, and other Economic-technical norms.
- Guidance and oversee the implementation of relevant laws, regulations, development plans and proposal of their modification if any.
- State management in the investment of electric and renewable power projects:
  - Review and submit for approval of investment intends, feasibility study, design after Basic Design; check for approval results of power projects under purview of the MOT.
  - BOT project: selection of developers after PPP framework, negotiation and submit BOT contracts to the government, and follow-on management.
  - Submit for approval for renewable energy and new energy projects on sea bed under the authority of the government, and opinions of MOIT for the involvement of international investors for power projects.
- Electricity regulations activities:
  - Review and issue electricity permits,
  - Review of power tariff,
  - Review and submit annual operation of plan for power grid and power market, oversee of the operation activities.
- State ownership responsibility (partly assigned) of the National Power System and Market Operator Company Ltd. (NSMO).

c) Stated owned energy corporations/groups

State-owned corporations/groups operating in the energy sector such as Vietnam Electricity (EVN), Vietnam National Industry - Energy Group (PVN), and Vietnam National Coal and Mineral Industries Group (TKV) are all under the state-owned ownership management of The Ministry of Finance (since March 2025). Besides are some state-owned enterprises taking part in the energy sector not within the management of CMSC but under the governing of the ministry under which those enterprises are operating. A typical example is the Northern East Corporation under the Ministry of National Defense which operates in coal exploitation activities.

c.1. Vietnam Electricity, EVN

Among those operating in the power/energy sector, EVN plays an important crucial role. Power generation plants under EVN and GENCO (Power Generation Corporations)

take the largest ratio in the electricity generating market. EVN manages transmission and distribution lines all over the country through NPT (National Power Transmission Corporation) and regional PCs (Power Corporation).

Presently EVN is the sole electricity offtaker and is the exclusive retailer through 05 regional power corporations. Through EVNNPT and PCs, EVN is now playing an exclusive position in the investment and construction of transmission line and power distribution projects except for very few pilot projects developed recently.

c.2. Other state-owned corporations

Other state-owned companies like TKV, and PVN take part in the electricity sector as suppliers supplying coal, oil, and gas to power generation plants and at the same time owing to some power generation plants as well.

If the Lam Son project is developed by PVP or its member, as PVP is a subsidiary of PVN, then the project company (if any) will be under this category.

c.3. Independent Power Producers, IPP

In addition to the above listed stated owned companies there are a series of IPP (Independent Power Plants) and BOT (Build Operate Transfer) plants which are owned by the public enterprise or private own or non-foreign ownership.

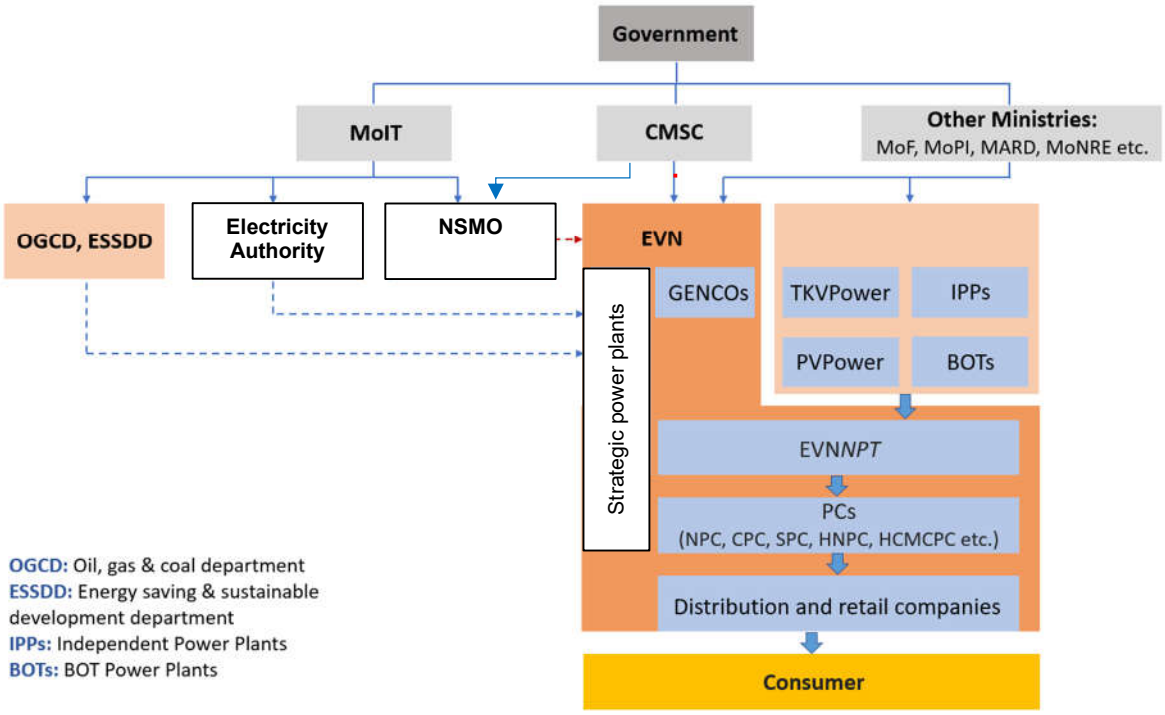

Figure 2-1: Management Flow Chart of Energy Sector (modified after ERAV)

2.1.2.2. *Operation of power system*

EVN is responsible for forecasting load demand and setting up the annual operation plan of the power system while EA reviews the later checks, inspects, and

supervises the power supply situation and runs the power system to assure balance in supply-demand.

The power system operation is performed by National Power System and Market Operator Company Ltd. (NSMO) and regional dispatch centers (A1, A2, A3). The dispatch is organized as shown in the flow chart below.

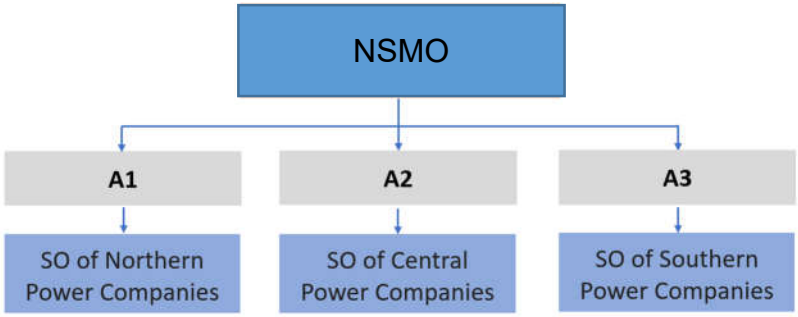

Figure 2-2: Organization of National Load Dispatch Center

Following are the main tasks and assignments of NSMO in power system operation:

- Grid operator: Establishment of method and controlling the grid operation.
- Telecommunication system management for grid and power market operation.
- Management of competitive power market.
- Give out the methods of operation and demand the operation of the national power system from transmission to distribution, assuring the quality of electricity sources and auxiliary services of the power system.

The provincial and district control centers will govern the distribution grids within their areas of responsibility.

Details of tasks and assignments in the national and regional dispatch levels and others are regulated in Circular 40/2014/TT-BCT issued by MOIT 5/11/2014.

The Lam Son project operation will be under supervision of National Power System and Market Operator Company Ltd. (NSMO).

2.1.2.3. *Power generation*

The total capacity of the national grid was 82.387 GW by the end of 2024, of which 26% was renewable energies (i.e. wind and solar power). Total grid generation was 308.73 billion kWh in 2024.

Table 2-7: National grid capacity by the end of 2024

Capacity	National	Northern region	Central Region	Southern Region
Maximum demand	54.510	28.351	5.590	23.890

Capacity	National	Northern region	Central Region	Southern Region
Maximum supply	82.387	29.230	17.986	35.170
Hydropower	23.664	13.385	7.915	2.364
Coal thermal	26.757	14.738	1.505	10.514
Gas and oil thermal	8.653			8.653
Renewable energy (solar and wind)	21.447	593	7.338	13.516
Import	1.222	341	881	0
Others	644	174	347	123

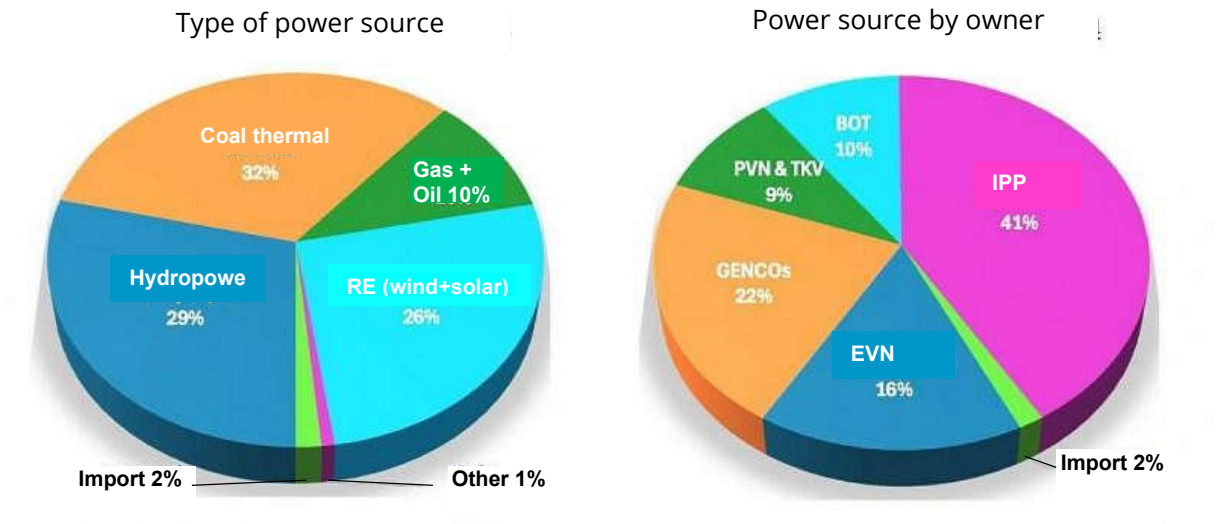

Figure 2-3: Supply sources for the national grid by the end of 2024 in percentage (left: types of power supply, right: ownership)

Table 2-8: Generation and import energy of the national grid in 2024

No.	Type	Generation (10^9 kWh)
1	Hydropower	88.723
2	Coal thermal	152.775
3	Gas thermal	21.827
4	Oil thermal	175
5	Import	5.144
6	Renewable energy, in which	39.641
-	Wind	12.747
-	Solar	25.862
-	Biomass	1032
7	Others	446
	Total	**308.732**

a) EVN power generation plants

In regards to the ownership and management, EVN owns or has governed shares at GENCO1, GENCO2, and GENCO3. Each GENCO owns or has governed shares at some power generation plants (mainly hydropower or coal fire thermal) located in 3 regions of North, Central, and South.

EVN owns 09 power generation companies directly under EVN among which 07 are hydropower and 02 are coal-fired thermal plants. Among these plants, 06 hydropower plants are listed as important ones in regards to socio-economic, national defense, and security[2]. These include 03 hydropower plants on Da river, 01 hydropower plants on Gam river, 01 on Se San river, and 01 on Dong Nai river. Those hydropower plants have flood control purposes and water supply to delta areas in its downstream area, except the laly hydropower plant located on Se San river which has a trans-border catchment area.

Besides, 03 regional power companies (Northern Power Company, Central Power Company, and South Power Company) also own small scaled power generation plants.

The total capacity of power generation plants under EVN and GENCO takes about 38% of the total power sources of Vietnam.

b) Non-EVN power generation plants

Private-owned power generation plants take a great part in the power system (up to 41% by the end of 2024, mainly are hydropower and renewable energy (wind and solar). Two big state-owned energy corporations as PVN and TKV own some hydropower plants and thermal plants (taking approximately 9% by end of 2024 in total). BOT power plants take about 10% of the power system.

c) Export and import electricity

Vietnam has signed agreements on electricity exchange with countries sharing the same in-land borders including China, Laos, and Cambodia. From China, Vietnam only imports; from Laos, mainly imports, and export (as well); to Cambodia, Vietnam export only. The imported electricity is limited, taking approximately 1.5% of the generation source in 2024.

2.1.2.4. *Power transmission and distribution*

National Power Transmission Corporation (EVNNPT), which is under EVN, is responsible for investment management (partial) and operation management of the power transmission system including voltage levels 500 kV (all) and 220 kV (part).

There are five regional PCs under EVN (namely North, Central, South, Hanoi, Ho Chi Minh City PCs) managing the transmission system (partly at 220 kV and fully below 220 kV) and the retail distribution system connecting to consumers.

[2] QD_2012_QD_TTg nam 2016.pdf (erav.vn)

The owners of power generation plants are responsible for the transmission lines connecting from their plants to the grid connection points. The voltages of these utility scale connections are from 35 kV up to 500 kV.

Due to the expected high voltage of the project, it is expected that the operator of the project will need to coordinate with EVNNPT.

2.2. Assessment of compliance with the Development Plans

2.2.1. *PDP8 (revision) and its implementation plan*

The National Power Development Plan for the period 2021–2030, with a vision to 2050 (PDP VIII) was approved by Decision No. 500/QĐ-TTg dated May 15, 2023 by the Prime Minister. Subsequently, its revision was approved by the Prime Minister's Decision No. 768/QĐ-TTg dated April 15,2025. The revised implementation plan was approved by the Minister of Industry and Trade's Decision No.1509/QĐ-BCT dated May 31, 2025. The relevant objectives of PDP VIII (revision) to the project are summarized as follow:

- On ensuring national energy security:
  - Sufficient domestic electricity supplies to meet the targets of socio-economic development, with an average GDP growth rate of approximately 10.0% per year during 2026–2030, and about 7.5% per year during 2031-2050:
  - Commercial generation: About 500.4 - 557.8 billion kWh by 2030; with an orientation for 2050 of about 1,237.7 - 1,375.1 billion kWh.
  - Generated and imported electricity: By 2030, about 560.4 - 624.6 billion kWh by; with an orientation for 2050 of about 1,360.1 - 1,511.1 billion kWh.
  - Peak demand: About 89,655 - 99,934 MW by 2030; by 2050, about 05,732 - 228,570 MW by 2050.
  - Safe and reliable electricity supply, meeting the N-1 criterion for critical load areas and N-2 criterion for especially critical load areas and nuclear power sources.
  - 50% of public office buildings and 50% of households to use rooftop solar power for self-generation and self-consumption (no feeding into the national grid) by 2030.
- On a just energy transition:
  - Strongly develop renewable energy sources (excluding hydropower) for electricity generation, reaching a share of approximately 28-36% by 2030. With a target of increasing the share to 74-75% by 2050.
  - Control greenhouse gas emissions from electricity production to around 197-199 million tons by 2030, and reduce to around 27 million tons by 2050. Aim to reach peak emissions of no more than 170 million tons by 2030, conditional

upon the full and substantive implementation of commitments under the JETP (Just Energy Transition Partnership) by international partners.

- Develop a smart power grid capable of safely and efficiently integrating and operating large-scale renewable energy sources.

Details are shown in the following table.

Table 2-9: Summary of grid development after Decision No. 768/QĐ-TTg dated April 15,2025 on Approving the Revision of the National Power Development Plan for the Period 2021–2030, with a Vision to 2050

No.	Name of Decision	Unit	Values in year of	
			2030	2050
I.	**Commercial energy**	10^9 kWh	500.400 - 557.800	1,237.700 - 1,375.100
II.	**Peak demand**	GW	89.655 - 99.934	205.732 - 228.570
III.	**Total supply**	GW	183.291 - 236.363	774.503 - 838.681
	Onshore and nearshore wind	GW	26.066 - 38.029	84.696 - 91.400
	Offshore wind	GW	*6.000 - 17.032	113.503 - 139.097
	Solar (farms and rooftop)	GW	46.459 - 73.416	293.088 - 295.646
	Biomass	GW	1.523 - 2.699	4.829 - 6.960
	Waste to Energy	GW	1.441 - 2.137	1.784 -2.137
	Geothermal and other renewable energies	GW	0.045	0.464
	Hydropower	GW	33.294 - 34.667	40.624
	Nuclear	GW	*4.000 - 6.400	10.500 - 14.000
	Energy Storage Systems	GW	10.000 - 16.300	95.983 - 96.120
	Pumped storage	GW	2.400 - 6.000	20.691 - 21.327
	Coal thermal	GW	31.055	0
	Domestic gas thermal	GW	10.861 - 14.930	
	LNG thermal	GW	22.524	
	Biomass and ammoniac thermal	GW		25.798
	Domestic gas and converted to LNG	GW		7.900
	Domestic gas fully converted to hydrogen	GW		7.030
	LNG CCS (carbon capture and storage)	GW		1.887 - 2.269
	LNG co-fire with hydrogen	GW		18.200 - 26.123
	LNG fully converted to hydrogen	GW		8.576 - 11.325
	Flexible sources	GW	2.000 - 3.000	21.333 - 38.641
	Import	GW	9.360 - 12.100	11.042
	Export	GW	0.400	14.688

No.	Name of Decision	Unit	Values in year of	
			2030	2050
	Direct PPA	%		30 - 60% of total renewable energy generation
IV	**Transmission**			
	Newly built 500 kV substations	MVA	102.900	72.900
	Rehabilitated 500 kV substations	MVA	23.250	102.600
	Newly built 500 kV transmission lines	km	12.944	7.846
	Rehabilitated 500 kV transmission lines	km	1.404	750
	Newly built 220 kV substations	MVA	105.565	81.875
	Rehabilitated 220 kV substations	MVA	17.509	103.125
	Newly built 220 kV transmission lines	km	15.307	5.370
	Rehabilitated 220 kV transmission lines	km	5.483	830
	HVDC substations	MW		26.000 - 36.000
	HVDC transmission line	km		3.600 - 6.700
	HVAC > 500 kV conversion station	MVA		24.000
	HVAC > 500 kV transmission line	km		2.500

Note: * period of 2030 - 2035.

It is important to note from Appendices of Implementation Plan for PDP VIII (Revision) that there are:

- 52 named solar farms in the former Ninh Thuan Province, of which 19 ones will be finished by 2030 with a combined capacity of 2148 MW, the remaining 33 ones will be finished by 2035 with a combined capacity of 3469.5 MW.
- 02 named pumped storage projects will be finished by 2030 in the former Ninh Thuan Province. They are Bac Ai and Phuoc Hoa, each with a capacity of 1200 MW. There are two other PSP projects registered in PDP VIII in other provinces (Dong Phu Yen - 900 MW and Don Duong - 300 MW). By 2035 the increased capacity for PSP will be 7.072 GW with another 18 named projects in other provinces.
- Besides 07 named Battery Energy Storage Systems (BESS) with a combined capacity of 318 MW, there will be further 20.287 GW BESS planned for the period of 2025 to 2035.

- In the formed Ninh Thuan province the Ninh Son 2700 MVA substation will be built before 2030. The Ninh Thuan 1 (1800 MVA) and 2 (1800 MWA) substations will be built before 2035.
- Excluding the transmission line for the nuclear power plants, there will be four 500 kV double-circuit transmission lines connecting to the Ninh Son Substation by 2030. By 2035 the two Ninh Thuan 1 and 2 substations will be connected to the Ninh Son one by two 500 kV double-circuit transmission lines. It should be also noted that the Ninh Son substation will be invested by the state, whereas the Ninh Thuan 1 & 2 are planned to be socialized investment.
- The Lam Son complex is not listed in the revised PDP VIII and its implementation plan. However due to the merge of a number of provinces, the validity of PDP VIII with the development of new provinces is questionable.

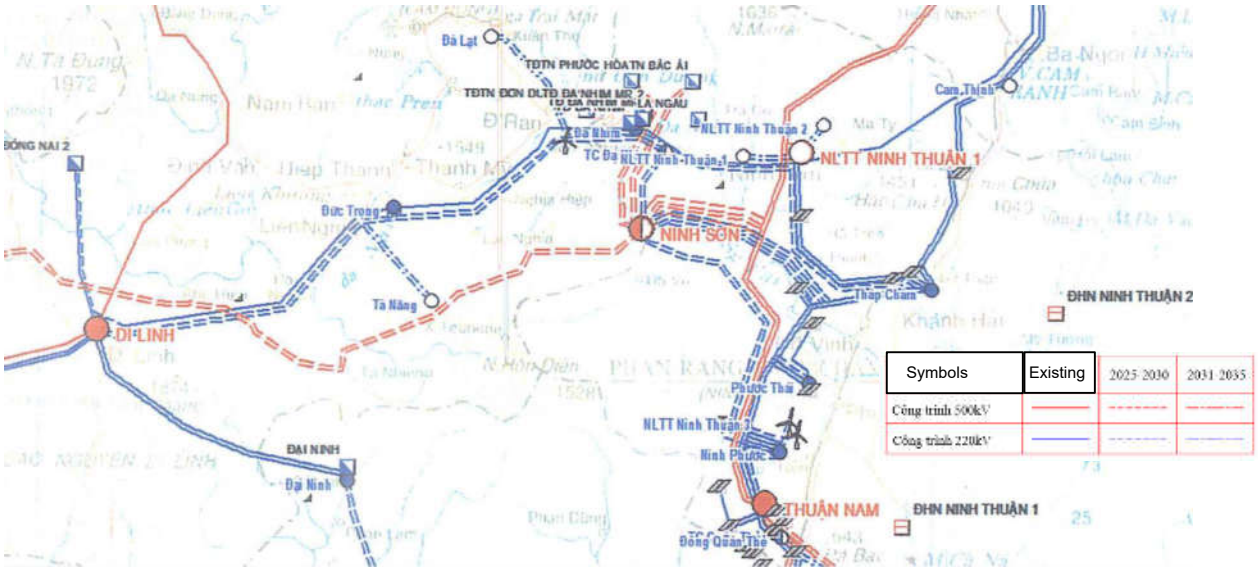

Figure 2-4: Planned 220 kV and 500 kV grid development around former Ninh Thuan Province after PDP VIII

In any circumstance, the project can contribute to meet the targets of 293.088 - 295.646 GW of solar power and 20.691 - 21.327 GW of pumped storage by 2050 in the revised PDP VIII.

2.2.2. *Provincial Development Plan*

The new Khanh Hoa Province has not had a new Provincial Development Plan. There are only approved development plans for the former Ninh Thuan and Khanh Hoa provinces by the Prime Minister. As a starting point the development plan of the former Ninh Thuan province will be reviewed.

2.2.2.1. *General target*

Decision No. 1319/QĐ-TTg dated November 11, 2023 was signed by the Prime Minister on Approval of Development Plan of Ninh Thuan Province for the period of 2021 – 2030, with a vision to 2050. Its Implementation Plan was approved by the Prime Minister

on Decision No. 1483/QĐ-TTg dated November 29, 2024. The major objectives of the development plan by 2030 are as follow:

a) General Objectives

By 2030, Ninh Thuan Province aims to:

- Become a province with average-high per capita income nationwide.
- Develop into a dynamic, fast, and sustainable economy, with marine and urban economies as growth drivers.
- Focus development in the southern region of the province, laying the foundation for the establishment of a coastal economic zone.
- Build synchronized socio-economic infrastructure with high resilience to natural disasters and epidemics, and adapt effectively to climate change, especially in managing water resources to meet usage demands and ensure balanced, reasonable distribution to support socio-economic development.
- Preserve and promote cultural values of ethnic communities.
- Improve material and spiritual living standards for the people.
- Ensure strong national defense and security.

b) Specific Objectives and Indicators

b.1. Economy

- Average GRDP growth: 10 - 11% per year.
- Per capita GRDP (current price): around VND 200 million.
- GRDP structure:
  - Industry & Construction: 53 - 54%
  - Services: 34 - 35%
  - Agriculture, Forestry & Fisheries: 12 - 13%
  - Product taxes minus subsidies: 2 - 3%
- Digital economy to contribute approximately 30% of GRDP by 2030.
- Total Factor Productivity (TFP) to contribute about 50% to growth and maintain an above-average level nationally in following years.

b.2. Society

- Population growth rate: 1.89% per year.
- Trained workforce: 75 - 80%, with >40% holding diplomas/certificates.
- Human Development Index (HDI): on par with the national average.

- Percentage of schools meeting national standards:
  - Preschool: 50.2%
  - Primary: 85.8%
  - Lower secondary: 74.6%
  - Upper secondary: 69.2%
- Maintain 100% of commune- and district-level units meeting early childhood education standards for 5-year-olds, with a goal to universalize preschool education for children under 5 and achieve level 2 literacy eradication.
- Hospital beds per 10,000 people: 35
- Doctors per 10,000 people: 11
- Urbanization rate: 55 - 56%; all Class III and higher urban areas to meet infrastructure criteria, particularly in health, education, training, and cultural facilities.
- Multidimensional poverty rate (under new standards): reduce by 1.5 - 2% annually, reaching under 1.5% by 2030.

b.3. Resources and Environment

- Forest coverage: Maintained at ~49%.
- Access to clean water: 100% of both urban and rural populations.
- Urban solid waste:
  - 100% collected and treated per standards.
  - 90% recycled, reused, or used for energy/fertilizer production.
  - Only 10% directly landfilled.
- Rural solid waste: 90% collected and treated per standards.
- Hazardous waste treatment: 98%, with medical waste at 100%.
- Industrial zones and clusters:
  - 100% have centralized wastewater treatment systems meeting discharge standards.
  - 100% of businesses meet environmental regulations.
  - 100% of domestic wastewater collected and treated to standards suitable for reuse in domestic water sources.

b.4. Infrastructure Development

- Transport infrastructure:

- Complete the North–South Expressway through the province.
- Upgrade national highways to at least grade III standard.
- Upgrade provincial roads to at least grade IV; 100% of provincial and local roads to be paved (asphalt/concrete).

- Port development:
  - Develop Ninh Thuan's seaport system: Ca Na and Ninh Chu to become national general ports, handling bulk cargo, containers, and liquid/gas.
- Airport investment: Develop Thanh Son Airport.
- New Rural Development:
  - 50% of communes will meet advanced new rural standards.
  - 20% of communes to reach exemplary new rural standards.
  - At least 5 districts will meet new rural standards, with 2 achieving advanced status.
- Information and communications:
  - Infrastructure to meet digital transformation needs.
  - 100% end-to-end online public services.
  - Complete 4G infrastructure and develop 5G in urban areas and industrial zones to support smart manufacturing.

b.5. National Defense and Security

- 100% of communes, wards, and towns to achieve comprehensive strength.
- Integrate socio-economic development with defense and security enhancement.
- Build a solid defensive area, ensuring political stability and social order and safety.

2.2.2.2. *Power development plan*

It is estimated that by 2030 the total demand for the former Ninh Thuan province will be 1.370×10^9 kWh for the base case and 1.503×10^9 kWh for the high case development[3]. The development plan for the former Ninh Thuan province intends that power and renewable energy will account for 12% of the provincial GDP and 7.3% of the work forces. It will concentrate for facilitating the maximum development of solar, nearshore and offshore wind power, LNG thermal, pumped storage, and other new energy (hydrogen, tidal, biomass etc.).

The power development plant of the former Ninh Thuan province was synchronized and updated by the PDP VIII (revision). Details can be seen in APPENDIX 1.

[3] Based on confidential information

The Lam Son complex is not listed in the provincial development plan. If the Lam Son complex is developed, the projected long-term annual generation of 4.474×10^9 kWh will surpass the peak planned demand by 2030 of the former Ninh Thuan Province. Thus the role of the project should be mainly exporting to other demand centers in the North or South Region of the country.

2.2.3. *Implication of the Resolution No. 70-NQ/TW by the Politburo of the Communist Party of Vietnam*

Recently the Politburo of the Communist Party of Vietnam issued the Resolution No. 70-NQ/TW on Ensuring National Energy Security by 2030, with a Vision to 2045 in August 08th, 2025. Although it is not a legislation, because the Communist Party is the ruling party, this Resolution will provide a directive for energy development in Vietnam. Several important targets before 2030 in this Resolution, which is relevant to the Lam Son complex development are extracted as follow:

- Energy development is the highest priority to meet the continuous growth requirement of over 10% in the coming period.
- Prioritize the development of clean, renewable energies with promotion of the comparative advantages of each region,
- Total primary energy supply of about 150 - 170 million tons of oil equivalent (TOE); total capacity of power sources of about 183 - 236 GW or possibly higher depending on system demand and the socio-economic development situation over periods; total electricity output of about 560 - 624 billion kWh. The proportion of renewable energy in the total primary energy supply is about 25 - 30%.
- Reduce greenhouse gas emissions from energy activities compared to the business-as-usual development scenario by about 15 - 35%.

The lower boundary of 183 GW capacity by 2030 seems to be met by the current planning in the PDP VIII (revision). However, the upper boundary of 236 GW must be met by new domestic and imported sources of generation. The resolution is not specific for the generation mix; thus it should be expected that the Government will need to update the PDP VIII to meet this directive. New projects can be submitted for consideration for the updated PDP VIII.

2.3. Suitability of Lam Son Complex to the development plans

2.3.1. *Challenges in implementation of PDP VIII and the Resolution No. 70-NQ/TW*

There are several challenges in implementation of PDP VIII. The major challenge is to increase the national supply capacity by 2030. It took about more than 40 years of development so that the total grid capacity was approximately 84.400 GW by the end of 2024. The PDP VIII revision plan for at least 183.291 GW by 2030, i.e. increased by 117% of the grid capacity within 5 years. If the high end target of 236 GW in the Resolution No.

70-NQ/TW is to be met, the capacity increase from 2025 to 2030 will be 280%! In any circumstance that will be an extra-ordinary demanding task.

In detail LNG, offshore wind and pumped storage developments are some of the most notable issues[4].

a) *LNG targets*

There are several challenges in implementation of PDP VIII. After the revised plan there will be 15 LNG thermal power plants to be finished by 2030 with a combined capacity of 22.524 GW. However only Nhon Trach 3 and 4 plants developed by PVP will be in commercial operation in Quarter IV, 2025. It has not been able to select a developer for the Nghi Son LNG project after two rounds of tendering . Other LNG projects have various issues, such as high investment costs, long development durations (up to 7 to 10 years), uncertainties in long-term confirmation of LNG demand by EVN and mechanism for accounting gas prices to electricity tariff. Especially the high tariff of 3,327.42 VND/kWh (about 12.7 USc/kWh) for LNG projects in the Circular No. 09/2025/TT-BCT will not be much desirable for the combined generation cost for the national grid.

Besides, infrastructures for LNG terminals are mainly in planning stages. There is only Thi Vai LNG terminal available[5]. Thus the targets for LNG power development by 2030 will face significant risks. That may jeopardize the 22.524 GW LNG targets by 2030 in the revised PDP VIII.

b) *Offshore wind*

Offshore wind projects will also need a long period of development. International experiences indicate that the development period will be 6 to 8 years. So far there is no licensed investor for any offshore wind project in Vietnam. Thus the target of 6.000 GW will also be challenging for offshore wind development.

c) *Development of pumped storage projects*

The implementation plan for PDP VIII (revised) allocates 3600 MW capacity of Pumped Storage Projects (PSP) for the period of 2025-2030, in which 2700 MW capacity of Pumped Storage Projects (PSP) at Ninh Thuan and Lam Dong province. Only Bac Ai PSP is under construction. The rest have yet to have the licensed investors. Thus there is certain risk in meeting the PSP target for PDP VIII.

[4] Challenges in power investment progress according to Power Plan VIII Adjustment | Vietnam Energy Magazine

[5] Realizing the adjusted Power Plan VIII goals and solutions for power sources by 2030

2.3.2. *The role of the Lam Son complex in context of the PDP VIII (revised) and the Resolution No. 70-NQ/TW*

From the above it can be seen that there will be challenged to meet the development of power supply for the Vietnamese national grid for the period of 2025 - 2030 and also 2030 - 2035.

The Lam Son complex is not considered in the revised PDP VIII and the provincial development. The total solar capacity of the project is higher than the existing capacity listed in PDP VIII (revised) for the province before 2030 or even before 2035. Similarly, the existing project capacity for pumped storage is already more than maximum allocation value of 6000 MW for the period before 2030.

However, based on the PDP VIII (revised) and its implementation plan, there is still room for project development. Total solar power capacity, including rooftop, by the end of 2024 was about 16670 MW[p]. PDP VIII (revised) projects a total solar power capacity of 46459 - 73416 MW by the end of 2030. Thus there will be 29789 - 56746 MW capacity for development from 2025 to 2030. The capacity by 2030 for named solar farms in the Appendices of the Implementation Plan of the PDP VIII (revised) is 23830 MW. Thus there will be 5959 - 32916 MW of unallocated capacity for solar power.

The rooftop solar would be capable of taking the majority of the lower end of 5959 MW capacity left. Yet it may be still possible for a portion of the solar component (and associated BESS) of the project, say 1200 MWp, to be accounted for this remaining capacity by 2030. For the higher end of 32916 MW of unallocated capacity, there will be much more room for the solar component (and BESS) of the project to be accounted for in the PDP VIII (revised). More capacity should be expected after 2030.

Table 2-1: Unallocated solar power capacity by 2030 in PDP VIII (revised)

	Low case	**High case**
Total solar capacity by 2030, MW	46459	73416
Existing capacity by end of 2024, MW	16670	16670
Capacity for named PV projects by 2030 in implementation plan of PDP VIII, MW	23830	23830
Unallocated capacity by 2030, MW	5959	32916

If the generation targets in the Resolution No. 70-NQ/TW is to be meet, beside existing planned projects in the PDP VIII (revised) up to 53 GW of new capacity will need to be identified for the grid development. With the expected proportion of renewable energies of 25 to 30% in the resolution, up to 13.25 to 15.9 GW of additional capacity of renewable energies will need to be mobilized before 2030, and more after that period.

The Lam Son complex can be designed as a stable power supply by combining the relatively low energy cost from solar power with an energy backup systems by pumped storage and BESS. Thus it can be an attractive alternative to substitute for a potential

delayed generation project. From PDP VIII planning perspective the Lam Son project will be more suitable to be partly operated before 2030 for a portion of the solar and BESS components and the remaining be commissioned before 2035. If the more ambitious target of 236 GW before 2030 in the Resolution No. 70-NQ/TW is to be met, the full capacity of 3.5 GWp of solar, 350 MW of BESS and 1.44 GW of PSP from the Lam Son complex will be in a good position to take into account in for the planning for the period before 2030.

The project will also meet the objective of maximum development of renewable energy in the former Ninh Thuan province. It is also expected that the project will also be suitable for the Development Plan of the new Khanh Hoa Province.

With a long-term annual generation of 4474 GWh it is conservatively estimated[6] that the Lam Son complex can help to reduce the carbon emission of 2.95 million tons of CO_2 per year. That will certainly contribute to the target of controlling greenhouse gas emissions from electricity production to around 197–199 million tons by 2030, and reduce to around 27 million tons by 2050 in the revised PDP VIII.

[6] After Official Letter No. 1726/BĐKH-PTCBTE by Department of Climate Change of Vietnam dated December 03th, 2024 the mission coefficient of the Vietnamese national grid was 0.6592 CO_2 ton/MWh.

Reference: http://www.dcc.gov.vn/van-ban-phap-luat/1124/He-so-phat-thai-luoi-dien-Viet-Nam-2023.html

3. FINANCIAL ANALYSIS AND IDENTIFICATION OF POTENTIAL FUNDING SOURCES

3.1. Power markets

3.1.1. *Types of electricity markets*

There are several types of electricity markets:

- Competitive markets: applicable for generation from large traditional power plants (large hydropower with installed capacity of more than 30 MW and thermal power plants. It is planned to apply for the retail power market also.
- Feed-in-Tariff: applicable for renewable power plants other than hydropower. This mechanism is no longer valid for new wind and solar projects.
- Avoided-Cost-Tariff: applicable for small hydropower plants of less than 30 MW.
- Auction (Tendering): applicable for all new projects, except one of the following: (i) strategic power projects, (ii) the emergency power projects, (iii) project development by the fully state-owned entities, (iv) expansion of existing hydropower plants or upgrade of existing transmission lines, (v.) offshore wind projects under central government authorities.
- Direct Power Purchase Agreement.

According to Decision No. 63/2013, the electricity market shall be established and developed through the 3 steps: Vietnam Competitive Generation Market (VCGM), Vietnam Wholesale Electricity Market (VWEM), and Vietnam Retail Electricity Market (VREM). Power market developments at steps 1 (VCGM) and 2 (VWEM) were officially operated from July 01, 2012 and January 01, 2019. The retail market (VREM) has not been implemented yet.

Table 3-1 Various Steps of Vietnamese Electricity Market: Planning and Implementation

Steps	Stage	Planning (Decision No. 63/2013/QGG-TTg)	Implementation
VCGM Mandatory Gross Cost-Based Pool	Design VCGM		31/12/2009: Approval of design
	Pilot	2011-2012	Pilot operation of VCGM
	Completion		01/07/2012 officially operation
VWEM	Design VWEM		10/08/2015: Approval of design
	Pilot	2016-2018	2016-2018: pilot operation of VWEM
	Completion	2019	01/01/2019: officially operation of VWEM;
VREM	Design VREM		03/08/2020: Approval of design

Steps	Stage	Planning (Decision No. 63/2013/QGG-TTg)	Implementation
	Pilot	2021-2022	Not yet
	Completion	2023	Not yet

For the purpose of this assignment only the Vietnam Wholesale Electricity Market (VWEM) and the Auction mechanism will be taken into account.

3.1.2. *Vietnam wholesale electricity market - VWEM*

3.1.2.1. *Structure and participants of VWEM*

The VWEM is structured as below:

- Sellers: are generation utilities who own traditional power plants, i.e. hydropower or thermal generation, with installed capacity from 30 MW; and other hydropower plants of more than 10 MW or renewable plants with expired ACT or FiT period, or BOT plants with expired BOT contracts;
- Buyers, include five (05) Power Corporations; big consumer(s) buying electricity from voltage level 110 kV and higher, or new buyers permitted by MOIT;
- Service suppliers include System and Market Operator (NSMO); Power transmission utilities (EVNNPT); Electricity distribution utilities (PCs); Data acquisition and management.

3.1.2.2. *VWEM Transactions*

There are two kinds of transactions in the VWEM, namely physical electricity transactions and financial transactions. The financial market is operated independently of the physical market.

- The financial contract-based transaction is performed by means of contractual agreements to facilitate parties in risk management in case of cost variation on the physical market (cash market). The reference price for a financial contract will be the energy price of the electricity cash market.
- The physical electricity transaction includes cash market (the next day market) and bilateral contract (PPA);

3.1.2.3. *Electricity cash market*

A cash market or spot market is the type of next-day balance market, operating on the basis of voluntary and self-regulation. The electricity cash market in Vietnam is the complete market model, concentrated regulation, bidding price on a Cost-Based gross pool basis, with transaction and regulation intervals of 30 minutes/interval and 48 intervals per day. The market applies the spot delivery on the whole market and ex-post determination. The market is operated in steps as below:

- Set up the market operation plan;
- Offer next day price;
- Prepare mobilization schedule;
- The electricity cash market price is applied to generation utilities;
- Pay generation utilities.

3.1.2.4. *Bilateral Contract*

A bilateral Contract (PPA) is a physical contract signed directly between the buyer and generation utilities who newly join the VWEM. The contract is the tool to share the risk between the seller and the buyer. In which two parties will come to an agreement on the contracted quantity (Q_c), contracted forward price (P_c), and reference price will be the price of the cash market (P_m).

It should be noted that the percentage of Q_c (the fixed price component) can be variable after the decision by MOIT.

3.1.3. *Power purchase with EVN for renewable energy projects*

All major operating wind and solar power plants should have a power purchase agreement with Electricity Power Trading Company - EVN Branch (EVNEPTC). The existing ones are under FiT agreements if they met the FiT deadlines, or under a transitional ceiling tariff imposed by the government[7].

Except certain exemptions quoted in the Law of Electricity, a new power project will have to go through an auction (bidding process) if there are more than one investor interested in the project. The criterion for selecting the investor is the bid tariff. The bid tariff will be the maximum value for negotiation with EVNEPTC.

3.1.4. *Direct power purchase agreement*

The current legislation (Decrees No.57/2025/NĐCP[8]) allows major electric users to purchase electricity from renewable energy plants through the Direct Power Purchase Agreements (DPPA mechanism). Conditions for sellers and buyers for DPPA are as follow:

- Sellers: having specifically wind, solar or biomass plants with a capacity of no less than 10 MW, connecting to the national grid and participating into the wholesale competitive power market,

[7] https://thuvienphapluat.vn/van-ban/Tai-nguyen-Moi-truong/Quyet-dinh-21-QD-BCT-2023-khung-gia-phat-dien-nha-may-dien-mat-troi-dien-gio-chuyen-tiep-549601.aspx

[8] https://datafiles.chinhphu.vn/cpp/files/vbpq/2025/3/57-nd.signed.pdf

- Buyer: connects at 22 kV voltage and meets the threshold of average consumption of 200,000 kWh or more per month as defined in Circular No. 16/2025/TT-BCT by MoIT[9].

There are two types of Direct Power Purchase mechanisms:

- Via a dedicated transmission line
  - A direct power purchase contract is signed between the renewable energy generator and the large consumer.
  - Electricity is delivered via a dedicated transmission line (not via the national grid).
  - Electricity tariff: negotiable within the ceiling price defined for the corresponding energy source.
  - Excess electricity can be sold to EVN (Vietnam Electricity) or power companies, with prices negotiated but still within the price ceiling.
  - For rooftop solar systems: surplus electricity (not exceeding 20% of generated electricity) can be sold at the average market price of the previous year, within price limits.
- Via the National Power Grid

This model is more flexible and does not require a private transmission line. It involves three key transactions:

- The renewable energy generator sells 100% of electricity into the spot market of the competitive wholesale electricity market.
- The large electricity consumer (or an authorized power retailer in industrial parks) signs a financial contract with the generator to hedge prices and stabilize supply.
- The consumer also signs a contract with EVN or authorized electricity units to buy electricity to meet real-time demand via the national grid.

By the time of writing this report, the Consultant has not been aware of any signed DPPA.

3.1.5. *Possible trading mechanisms for Lam Son*

There is no precedence for a project that combines solar power with pumped storage and BESS in Vietnam. Thus the legal framework for this type of energy generation complex is not clear. However, based on the existing mechanisms one of the following venues can be followed:

[9] 16-bct.pdf

3.1.5.1. *Power purchase with EVN for renewable energy projects*

Because energy from the project will be produce by solar, the direct purchase mechanism with EVN for wind and solar projects can be applied. A bid price will be the starting price for negotiation with EVNEPTC.

3.1.5.2. *Direct VWEM participation*

The large renewable plants can participate the Vietnam Wholesale Electricity Market. For large hydropower projects it is a must, except strategic one. Due to the more stable energy from the Lam Son project, the MOIT may require the developer to sign a PPA with EVN, in which the project will directly participate into the VWEM and the standard contract terms for conventional hydro is applied. With this option a firm price is applicable for Q_c component and variable prices will applied for the rest.

3.1.5.3. *DPPA*

The legal framework for the DPPA mechanism is currently being revised and finalized. The application of the DPPA to the Project is fully compliant with applicable laws. However, as the DPPA involves participation through the electricity market, similar to the PPA, the Project requires a comprehensive legal framework or detailed regulatory guidance to ensure proper implementation.

Under the DPPA scheme for direct power sales to large consumers, the Investor shall conduct a thorough assessment of potential eligible consumers, focusing on their power demand, distance from the Project, and the intended supply period, among other relevant factors to minimize operational risks to the Project.

Given the fact that the capacity and output from Lam Son project will be very significant, it is unlikely that a single DPPA with an end-user will be achieved. Multiple DPPAs may be required to absorbed the energy from the project.

3.1.5.4. *Ancillary Services Transaction*

The Government is preparing frameworks for ancillary services, which include those to ensure system reliability and stability, such as frequency regulation, spinning reserve, and voltage control. The Circular No. 11/2025/TT-BCT provides guidance to determine service costs, approval procedure, and contents of the PPA for this kind of services. Due to the availability of the PSP and BESS components, the Lam Son Project may be able to serve for ancillary services in the market.

3.1.5.5. *Assessment*

From above option the direct PPA with EVN for renewable energies can be beneficial for the Lam Son Developer as it can guarantee a stable tariff. Provided that there is no curtailment due to grid congestion, the majority of power generation of the Lam Son can be taken by the grid with guarantee from EVN.

The standard terms for PPA contracts for VWEM can be also acceptable if the fixed price component is sufficiently high and the percentage for the variable components,

which for peak demand hours are very attractive, are significant. In the future the Lam Son can also provide ancillary service to the grid beside the main contribution into the VWEM. However, the solar generation during normal hours may not be as valuable in market terms, leading to potentially lower revenue.

Thus there is a certain risk about purchase mechanism for the Lam Son Project due to uncertainty policies for this new type of combination of renewable energies and energy storage systems.

3.2. Method for economic and financial analysis

The economic efficiency of a project is assessed from the perspective of the entire national economy, reflecting the efficiency of using capital for project investment on the scale of the entire economy. However, the financial analysis is assessed from the Project's perspective (or the Owner's one).

In this report, the following basic indicators will be used to evaluate both of the economic and financial benefits of the project:

- The Levelized Cost of Electricity (LCOE).
- Net Present Value (NPV).
- Economic and Financial Interest Rate of Return (EIRR and FIRR).
- Benefit/Cost (B/C).

3.2.1. *Levelized Cost of Energy*

LCOE is a standard method in the economic analysis of energy projects, representing the cost to produce one unit of electrical energy (kWh) over the entire project lifecycle, including initial investment, operation, maintenance, and financing costs. This method allows for a direct comparison between different energy sources, independent of specific scale or operating duration.

In this report, we only calculate the project's LCOE for economic analysis, using it to compare with the LCOE of other potential alternative power projects in order to assess the project's economic feasibility.

The formula for calculating LCOE is as follows

$$\text{LCOE} = \frac{(CAPEX + DEVEX + OPEX)\text{converted to present}}{Equivelent\ \text{Electricity Output}}$$

Whereas:

- Initial Investment Cost (CAPEX): This is the total initial investment capital after deducting the input Value Added Tax (VAT).
- DEVEX is the total cost of project preparation and all remaining costs, including: management, consulting, interest during construction, insurance, other project preparation costs.

- OPEX is the costs during operation time: operation and maintenance cost; equipment replacement,
- DEVEX means decommissioning cost.
- LCOE depends largely on the change of CAPEX and power output.

The project's LCOE will be compared with the LCOE of fossil fuel sources, such as LNG generation. We chose to compare with LNG plants because LNG is the most expensive source of electricity produced from fossil fuel in the current power system and provides the same generation profile as the combination. If the LCOE of the Lam Son complex is lower than the LCOE of the compared LNG source, it can be said that Lam Son is an economically viable power source.

3.2.2. *NPV, IRR and B/C*

The three indicators are the results of the economic or financial analysis, which compare the project's costs and revenues over its entire lifecycle, converted to present values for the Economy or the Project (or Owner).

The methods for calculating NPV, IRR, and B/C in both economic and financial analyses are the same; however, the input data for costs and benefits differ due to the distinct perspectives of each analysis.

<table>
<tr><th colspan="2">Economic Analysis</th><th colspan="2">Financial Analysis</th></tr>
<tr><th>Cost</th><th>Benefit</th><th>Cost</th><th>Benefit</th></tr>
<tr><td>Total Investment cost</td><td rowspan="4">1. Energy benefit: Equal to Electricity price framework for LNG power plant, according to Decision No. 1313/QD-BCT dated May 13, 2025 by MOIT (3327.42 VND/kWh) multiplied by the project's electricity output
2. Benefit from carbon emission reduction credits</td><td>Depreciation</td><td rowspan="4">1. Energy benefit equal to The electricity selling price that ensures the Owner's FIRR reaches 12%, multiplied by the project's electricity output)
2. Benefit from carbon emission reduction credits</td></tr>
<tr><td>O&M cost during operation duration</td><td>O&M cost during operation duration</td></tr>
<tr><td>Decommissioning & equipment replacement cost</td><td>Decommissioning & equipment replacement cost</td></tr>
<tr><td>Financial cost for foreign capital</td><td>Total financial cost</td></tr>
</table>

For the economic analysis

The economic efficiency assessment is conducted for two scenarios: with and without revenue from the sale of carbon credits. The project is considered economically viable when ENPV > 0, EIRR > 10%, and B/C > 1.

For the financial analysis

- The electricity selling tariff that enables the equity FIRR to reach 12% serves as the basis for assessing the project's financial feasibility. The project is considered

financially feasible if its electricity selling price is lower than or comparable to that of other types of power generation sources within the power system.

- Two scenarios are considered: one that includes revenue from the sale of carbon credits and another that excludes it, both evaluated under the same base case conditions.
- Based on the electricity price determined in the base case scenario, several alternative scenarios with less favorable input parameters are developed to assess the sensitivity of the project's financial performance indicator.

3.3. Economic analysis

3.3.1. *Costs for economic analysis*

- Investment cost CAPEX is taken from analysis in Task 3: Preliminary Project Design and Analysis and summarized in the following table.

Table 3-1: Initial investment cost (CAPEX)

No.	COST ITEMS	VALUE BEFORE TAX (Mil. USD)			
		PSP (1440 MW)	PV (3500 MWp)	BESS (350 MW)	Amount
1	**Compensation, Site Clearance, and Resettlement Costs**	**0.822**	**322.409**	**0.113**	**323.344**
2	**Costs for civil works**	**259.664**	**531.676**	**14.668**	**806.008**
2.1	Civil Works/Construction	228.117	455.000	7.000	690.117
2.2	500 kV Grid transmission	31.547	76.676	7.668	115.891
3	**Equipment Costs**	**311.318**	**1,295.000**	**140.000**	**1,746.318**
4	**Project Management Costs; Construction Investment Consulting Costs and Other**	**57.098**	**182.668**	**15.467**	**255.233**
5	**Contingency**	**125.781**	**466.351**	**34.049**	**626.181**
5.1	Physical contingency (10% of items 1-4.1)	62.890	233.175	17.025	313.090
5.2	Price Contingency (10% of items 1-4.1)	62.890	233.175	17.025	313.090
	TOTAL	**754.683**	**2,798.103**	**204.297**	**3,757.084**

The disbursement schedule in accordance with the project's construction progress is presented in the following table.

Table 3-2: Distribution of construction costs during construction period

Total (USD)	Preparation year (USD)	Construction year 1 (USD)	Construction year 2 (USD)	Construction year 3 (USD)	Construction year 4 (USD)	Construction year 5 (USD)
3,757,083,945	**17,162,280**	**356,185,710**	**950,253,769**	**1,030,884,014**	**1,256,199,123**	**146,399,050**

- Operation and Maintenance (O&M) Costs:

- O&M costs applied to Solar power, i.e. Photovoltaic (PV) are 1.8% (according to Circular No. 12/2025/TT-BCT).
- O&M costs applied to Pumped Storage Hydropower (PSH) are 0.9% (according to the draft for determining the selling price of electricity from PSH, i.e. energy storage complexes, conducted by the Ministry of Industry and Trade (MOIT) in July 2025).

- Interest expenses on foreign loans for equipment procurement, with an interest rate of 7% per year, and a grace period for principal repayment during the construction phase, repayment term of the loan shall be 10 years starting from the date of commissioning.
- Equipment Replacement: The project is designed with a life time of 40 years, requiring replacement of key equipment (PV panels, BESS storage system and inverter, hydraulic equipment, etc.) to maintain performance and extend the operating life cycle, specifically:
  - BESS and inverter equipment of PV are replaced every 10 years.
  - Other components of PV are replaced in the 20th year of operation.
  - PSP equipment is to be replaced in the 21st year of operation.

  Panel decommissioning costs: for a 3.5 GW solar project, it is estimated at 5% of the initial PV CAPEX, equivalent to approximately USD 145 million, after deducting the recovery value from recycling and resale of components.
- Discount Rate for economic analysis is set at 10%.

3.3.2. *Economic benefit*

- Energy Benefit: equal to ceiling tariff for LNG power plant, according to Decision No. 1313/QD-BCT dated May 13, 2025 by MOIT (3,327.42 VND/kWh) multiplied by the project's net energy output. Net energy output is the amount of electrical energy and capacity supplied by the power plant to the power system after subtracting transmission losses and auxiliary power capacity of the plant.

The generation during a 20-cycle of solar component technical lifetime is shown in the following table. It should be noted that the efficiency reduction in solar panels is included in solar generation. The long term average annual generation is around 4.677 mil.kWh.

Table 3-3: Generation of the complex during one technical lifetime of solar energy component

Year	Total solar generation (GWh)	Solar generation directly to the grid (GWh)	BESS generation to the grid (GWh)	Pumped storage generation to the grid (GWh)	Total net project generation to the grid (GWh)
1	5512.94	2919.31	70.58	1687.24	**4677.14**

Year	Total solar generation (GWh)	Solar generation directly to the grid (GWh)	BESS generation to the grid (GWh)	Pumped storage generation to the grid (GWh)	Total net project generation to the grid (GWh)
2	5495.74	2915.20	71.23	1677.15	**4663.57**
3	5475.78	2910.41	71.98	1665.43	**4647.82**
4	5453.59	2905.10	72.82	1652.40	**4630.32**
5	5427.53	2898.85	73.80	1637.10	**4609.75**
6	5397.58	2891.67	74.93	1619.52	**4586.12**
7	5362.08	2883.17	76.27	1598.68	**4558.12**
8	5325.48	2874.40	77.66	1577.19	**4529.24**
9	5289.43	2865.76	79.02	1556.02	**4500.79**
10	5252.27	2856.85	80.42	1534.20	**4471.48**
11	5219.55	2849.01	81.65	1514.99	**4445.66**
12	5191.27	2842.24	82.72	1498.39	**4423.34**
13	5165.20	2835.99	83.70	1483.08	**4402.78**
14	5140.80	2830.14	84.63	1468.76	**4383.52**
15	5116.95	2824.43	85.53	1454.75	**4364.71**
16	5096.98	2819.64	86.28	1443.03	**4348.95**
17	5079.79	2815.52	86.93	1432.94	**4335.39**
18	5060.94	2811.00	87.64	1421.87	**4320.51**
19	5039.86	2805.95	88.44	1409.49	**4303.88**
20	5016.57	2800.37	89.31	1395.82	**4285.51**

- Benefit from carbon credits

  Vietnam's grid carbon emission factor is 0.6592 tCO_2/MWh (according to Circular No. 1762/BĐKH-PTCB.

  The project can be considered carbon-free. Therefore, the amount of CO_2 emission reduction during the project's operation can be considered equivalent to the grid emission factor multiplied by the project's electricity output.

  The carbon credit issuance period is 20 years.

- Ancillary Services Transaction

  Typically, the electricity price for ancillary services is about 10% higher or more than that of conventional generation, due to higher opportunity costs, more stringent technical requirements, and the limited number of power plants capable of providing such service.

Circular No. 11/2025/TT-BCT (issued February 1, 2025, by the Ministry of Industry and Trade) stipulates the method for determining and the procedures for approving the price of ancillary services in the power system, as well as the main contents of ancillary service supply contracts.

However, up to now, no specific figure or regulation has been officially issued regarding the electricity price for ancillary services. Therefore, in this report, we present it only as a potential benefit of the project without quantifying it

3.3.3. *Economic indicators of the project*

Four scenarios are considered: a base case, a case with 10% increase in capital, another with 10% decrease in generation output, and the other combined both 10% increase in capital and 10% decrease in generation output. Results are shown in the following table.

Table 3-4: LCOE of the project

	Base case	**10% increase in capital**	**10% decrease in electricity output**
LCOE (cent/KWh)	11.07	12.12	12.29

The two main components for calculating LCOE are Costs and Electricity output (LCOE = Costs/Electricity Output). Therefore, when assessing the sensitivity of LCOE, the two variables considered are Costs and Electricity output.

- The sensitivity of LCOE has been evaluated for a ±10% variation in electricity output.
- The costs include CAPEX and OPEX, with CAPEX accounting for approximately 82% of the total cost considered in the LCOE calculation. Therefore, in the sensitivity analysis of LCOE with respect to cost, the Consultant only examines variations in CAPEX (±10%).

Table 3-5: Economic indexes

Scenarios	**Tariff** USc/kWh	**Eo** mil. kWh	**Investment cost** mil. USD	**NPV** mil. USD	**EIRR** %	**B/C** -
CDM is not taken into account						
Base case	12.57	4474.43	3757.1	468.9	11.98	1.14
10% increase in capital (K+10%)	12.57	4474.43	4132.8	141.4	10.55	1.04
10% decrease in Output (E -10%)	12.57	4026.99	3757.1	76.7	10.33	1.02
K+10% and E-10%	12.57	4026.99	4132.8	-250.9	9.02	0.93
CDM is taken into account						
Base case	12.57	4474.43	3757.1	623.2	12.63	1.18

Scenarios	Tariff USc/kWh	Eo mil. kWh	Investment cost mil. USD	NPV mil. USD	EIRR %	B/C -
10% increase in capital (K+10%)	12.57	4474.43	4132.8	295.7	11.14	1.08
10% decrease Output (E -10%)	12.57	4026.99	3757.1	215.5	10.92	1.06
K+10% and E-10%	12.57	4026.99	4132.8	-112.0	9.57	0.97

The project's LCOE in the base case scenario is 11.07 USc/kWh. The base cases with or without carbon credit incomes have acceptable economic indexes. The project will be economically viable for 10% increase in capital or 10% decrease in generation output (or 10% tariff reduction) with carbon credit benefit. It is not economically viable for the combination of both of these adverse impacts.

3.4. Financial model analysis

3.4.1. *Costs for financial analysis*

Costs for financial analysis are similar to the one in the economic analysis.

3.4.2. *Funding models*

The expected capital structure is assumed to:

- Reduce risks for investors, by limiting equity capital.
- Optimize the cost of capital, because debt capital is cheaper than equity capital.
- Achieve a reasonable rate of return (IRR 12–15%).

With this goal, a typical capital structure as follows:

- Equity Capital (not less than 20%)
  - According to regulations, equity capital accounts for at least 20% of total investment capital.
  - Due to the characteristics of capital sources requiring high expected returns and high risks, equity capital usually accounts around 20%-25% *(share risks with other sources).* For Lam Son, in the study, equity is assumed to account for 20% to 25% for initial capital during project development and depth service. A 25% value will be used if lower one cannot be sufficient for depth service.
  - Expected return is 12%.
- Commercial Loans from domestic banks (estimated around 20%-30%)
  - Domestic banks currently impose credit limits on renewable energy projects due to risks associated with PPAs and long payback periods. However, they can still participate in co-financing arrangements with international banks, especially during the construction phase.

- According to actual project data (Sources: EVN RE 2023; IFC Vietnam RE Portfolio), BIDV, Vietcombank, Techcombank, and others typically provide about 20–30% of the total project debt for renewable energy projects.
- This local financing component helps ensure domestic cash flow availability, facilitate disbursement, and leverage locally secured assets as collateral.
- The commercial loan is assumed to be equal to 32% (equivalent to the construction cost component of the total investment capital); interest rate (in VND) is about 10%.

- Concessional Loans from DFIs (Development Finance Institutions)
  - Institutions such as IFC, ADB, KfW, AFD, and JICA typically provide direct financing for 10%–40% of total project investment, depending on the project's scale and the level of environmental sustainability ("greenness").
  - They may offer direct loans, or participate through credit guarantees and blended finance structures combining concessional and commercial capital.
  - In Vietnam, notable examples include:
    - Bac Lieu Wind Farm - financed 35% by ADB,
    - Trung Nam Wind Project - financed 30% by IFC and AFD,
    - Phu Lac Wind Farm - financed 40% by KfW.
  - In the report, the source is assumed about 48%, with interest rate around 7%/year.
- Green credit (Green Bonds)
  - Vietnam currently has policies in place to encourage the issuance of green bonds (Decree No. 06/2022/ND-CP and Circular No. 17/2022/TT-NHNN)
  - Several pioneering renewable energy projects (such as those developed by BCG Energy, Trung Nam, and Bamboo Capital) have issued green bonds equivalent to approximately 5-15% of their total investment capital.
  - The interest rate applicable to green credit (1%-3%) is generally lower than the market average; however, such financing typically requires credit guarantees. This represents a highly effective financing source for renewable energy projects. Normally, it may share about 5%-10% CAPEX.
  - Nevertheless, in Vietnam, only a limited number of projects have successfully accessed this source of capital, and the experience of project developers in utilizing it remains limited. So, in this study, this type of financing is presented for reference purposes only and is not included in the financial calculations, in order to ensure the reliability and feasibility of the results.

The Consultant assumes three funding models as below:

- Scenario 1: Domestic funding with 10% interest - this is the most expensive mode of investment possible,
- Scenario 2: USD loans of 7% for equipment purchase. This model is based on the guidance from the Circular No.12/2025/TT-BCT.
- Scenario 3: EUR loans of 4.46% for equipment purchase. This model represents possible development credits from European Unions.

Details of each funding models are shown in table below.

Table 3-6:Assumed financial models

Content	Source of funds				
	Equity Capital	Domestic commercial loan (VND)	Foreign loan (USD)	Foreign loan (EUR)	**Total**
Capital ratio					
Scenario 1	25%	75%			**100%**
Scenario 2	20%	34%	46%		**100%**
Scenario 3	20%	34%		46%	**100%**
Loan conditions					
Grace Period (years)	During construction				
Repayment period (years)	10	10	10	10	
Interest Rate (%/year)		10%	7%	4.46%	
Commitment fee (% on undisbursed amount)			0.30%	0.20%	
Appraisal fee (% on loan value)			0.50%	0.40%	
Management fee (%/year)			0.10%	0.10%	
Expected Equity IRR (Investor's expectation)	≥ 12%				

3.4.3. *Other related costs*

- Depreciation: (linear method)

  Depreciation for hydropower equipment: 15 years,
  Depreciation for solar power equipment: 15 years,
  Depreciation for other costs: 20 years,

- Corporate income tax

  The corporate income tax rate applied to the power complex will be: 10% for 15 years starting from the time the plant goes into operation, and 20%

afterwards. In addition, the project is also exempted from corporate income tax for the first 4 years and has a 50% reduction in the tax payable for the next 9 years.

- Project discount rate (I_{ck}): equal to the weighted average interest rate of capital sources mobilized for the project.

3.4.4. *Financial benefit*

- Energy benefit is defined as the electricity selling price that ensures the Project FIRR reaches 12%, which is the maximum value allowed by MoIT, multiplied by the project's annual electricity output.
- Benefit from carbon emission reduction credits is similar with the benefit calculated in economic analysis.

3.4.5. *Financial indicators of the project*

The financial indicators of the project are also evaluated with sensitivity analysis similar to that in the economic analysis, which includes base case, capital increased by 10%, generation decreased by 10%, and combination of capital increased by 10% and generation decreased by 10%. Results are shown in the following table. Details can be seen in the attached appendices.

Table 3-7: Financial indicators for various funding models

Scenario	**I_{ck}** %	**Tariff** USc/kWh	**Eo** mil. kWh	**Investment cost** mil. USD	**Interest during construction** mil. USD	**NPV** mil. USD	**FIRR** %	**B/C** -	**Payback period** year	**Break-even point** USc/kWh
Scenario 1										
Base case	8.26	10.61	4474.43	3757.1	865.3	419.68	12.00	1.12	15	9.44
E_0 reduced by 10%			4026.99	3757.1	865.3	24.48	8.43	1.01	37	10.53
Investment increased by 10%			4474.43	4132.8	951.9	85.65	8.85	1.03	32	10.37
E_0 reduced by 10% and Investment increased by 10%			4026.99	4132.8	951.9	-314.01	6.25	0.93	40	11.57
Scenario 2										
Base case	7.18	10.06	4474.43	3757.1	536.2	662.65	12.00	1.17	14	8.47
E_0 reduced by 10%			4026.99	3757.1	536.2	230.14	8.63	1.06	27	9.45
Investment increased by 10%			4474.43	4132.8	589.9	318.98	9.05	1.08	25	9.30
E_0 reduced by 10% and Investment increased by 10%			4026.99	4132.8	589.9	-118.56	6.48	0.98	40	10.38

Scenario	I_{ck} %	Tariff USc/kWh	Eo mil. kWh	Investment cost mil. USD	Interest during construction mil. USD	NPV mil. USD	FIRR %	B/C -	Payback period year	Break-even point USc/kWh
Scenario 3										
Base case	6.25	9.54	4474.43	3757.1	465.2	877.21	12.00	1.21	13	7.70
E_0 reduced by 10%			4026.99	3757.1	465.2	407.02	8.55	1.10	25	8.60
Investment increased by 10%			4474.43	4132.8	511.7	520.91	8.98	1.12	16	8.46
E_0 reduced by 10% and Investment increased by 10%			4026.99	4132.8	511.7	45.65	6.41	1.01	37	9.44

In order to achieve a FIRR = 12%, the Tariff of the project will be from 9.54 USc/kWh for Scenario 3 to 10.61 USc/kWh for Scenarios 1. All scenarios pass the sensitivity tests for either 10% increase investment or 10% reduction in income. The Scenario 3 has the best financial indicators as it also passes the sensitivity test for both 10% increase investment combined with 10% reduction in income.

For planning purpose the Scenario 2 is selected because it follows guidance of the MoIT. However, it is recommended that the Developer to find out the better loan conditions, or accept a lower discount rate, or combination of both to achieve a more beneficial outcome.

4. PRELIMINARY INVESTMENT ROADMAP AND FINANCIAL PROJECTIONS FOR THE PROJECT

The investment roadmap will be implemented in 2 parts of the project report: one part in this Task, one part will be completed after the results of Task 3 are completed.

In this Task, the contents will revolve around issues of estimating the project investment roadmap when considering the requirements of related legislation and institutions. In the following part of Task 3, the project investment roadmap will be quantified based on the results of technical and financial calculations for the project.

4.1. General steps in investment of power projects

There are five major investment stages of power projects after current Vietnamese regulations, which the Lam Son project development need to follow:

- Stage A: Preparation
- Stage B: Project development
- Stage C: Project Implementation
- Stage D: Operation and Maintenance
- Stage E: Decommission

General investment steps after current Vietnamese regulations are summarized in the following figure. It should be noted that almost all permits listed below are required for the Lam Son project.

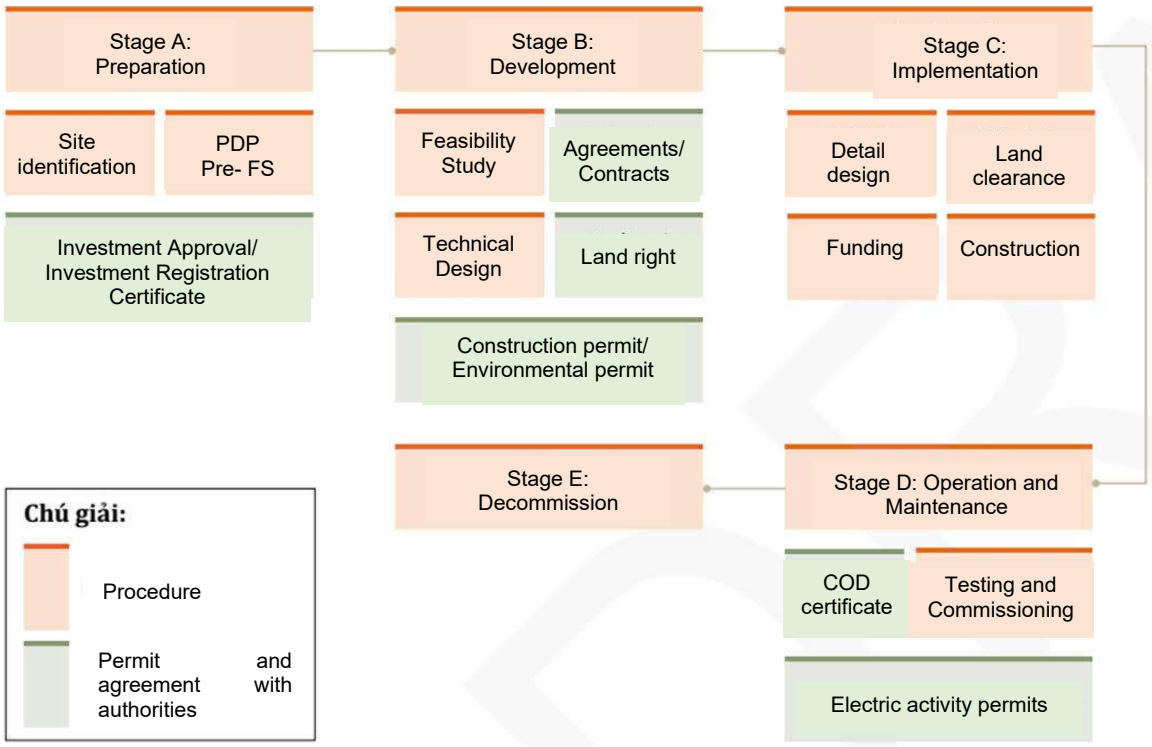

Figure 4-1: General investment steps for power projects in Vietnam[10]

4.1.1. *Step A: Preparation*

Flow chart for Step A: Preparation is shown in the following figure.

[10] The project implementation steps illustrated in Figure 4-1 were summarized by the Consultant based on current regulations and standard procedures, specifically Decree No. 175/2024/NĐ-CP and Decree No. 56/2025/NĐ-CP.

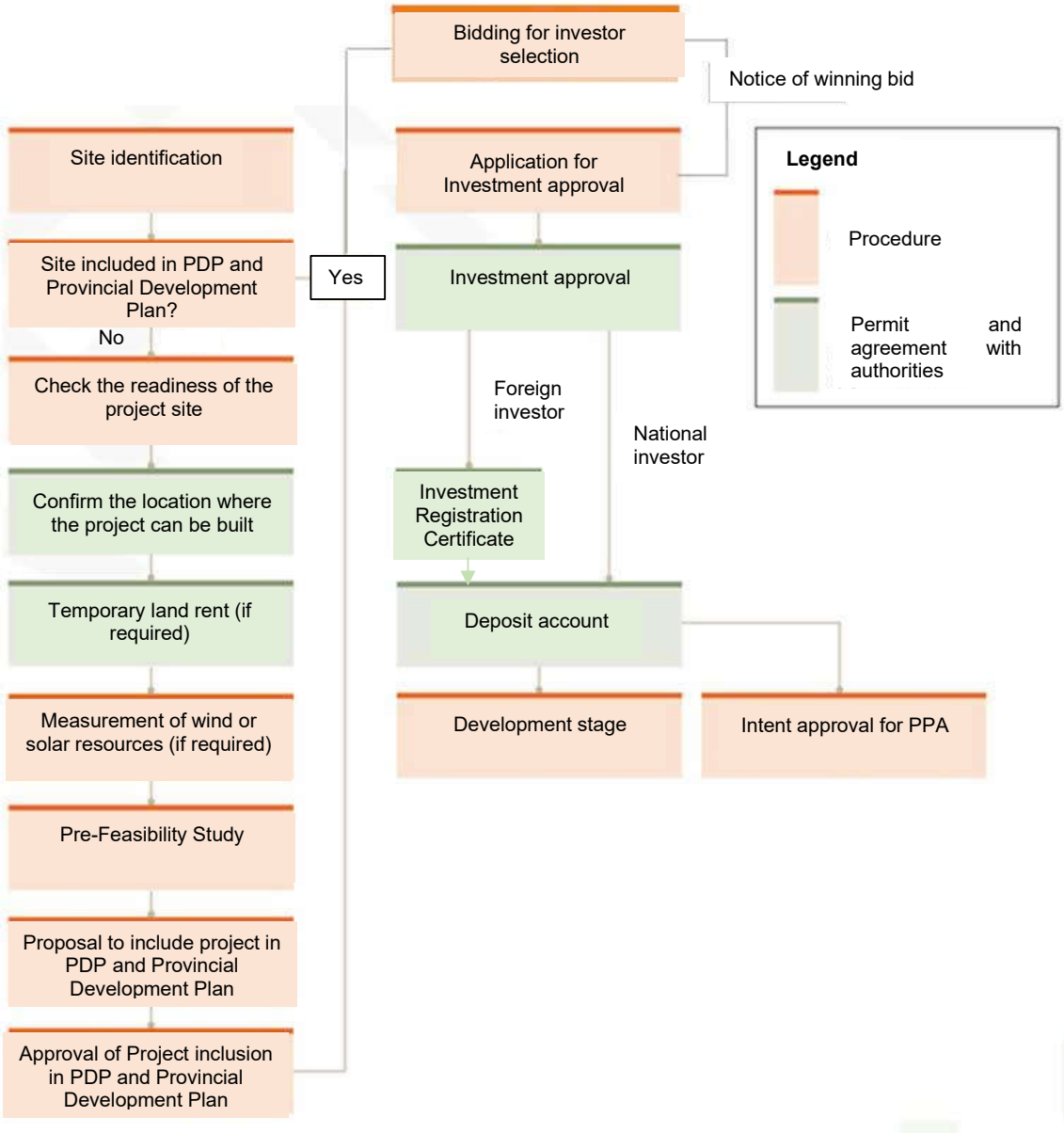

Figure 4-2: Stage A: Preparation[11]

4.1.1.1. *Determination of planning compliance*

The Developer need to implement the following:

- Check whether the project is included in the **National Power Development Plan** (PDP VIII revision) and related plans, such as Provincial Development Plan, Provincial Land Use Plan. It is also important to check if the project can be impacted by other national sector plans, for instance water resources, mining, forestry.

[11] The information in the Figure 4 2 were summarized by the Consultant based on current regulations and standard procedures as well as the Consultant's experience in implementing power projects, refering to Chapter 2 and Chap 5 of Decree No. 56/2025/NĐ-CP and Article 4. Investment of Decree No. 175/2024/NĐ-CP

- If the project is not included in the PDP Plan and/or provincial plan, it is necessary to **propose additional planning**.

Because the Lam Son complex has not been considered in revised PDP VIII and the Ninh Thuan provincial development plan, it needs to be submitted in both planning. There is significant risk for the inclusion of the Lam Son project into the updated PDP VIII and the new Khanh Hoa provincial development plan. If the project is not included in this PDP VIII, it will need to be added in PDP IX for the period of 2031 to 2040. That will delay the project implementation by at least 5 years.

4.1.1.2. *Site survey & and preparation of planning document*

In order to be included in the development plan, the Developer may need to conduct the construction site survey, such as radiation measurement for solar power. Alternatively, other method for site assessment from literature or satellite data may be used as a substitution. Based on the site survey results a Project Proposal for Inclusion in the PDP/Provincial development plan will be submitted to the competent authorities, such as the Electricity Authority of Vietnam (Ministry of Industry and Trade) and/or the Provincial People's Committee for confirmation.

A Pre-Feasibility Study may also be prepared by the Developer before, in parallel or after the Project Proposal for Inclusion in the PDP/Provincial development plan.

The Lam Son project is under this stage.

4.1.1.3. *Document preparation for investment approval in principle*

- Apply pursuant to the Investment Law 2020 (revised):
  - **Large-**scale **projects**, environment impact, use of forest land, with foreign elements and so on must apply for investment policy from:
    - Provincial People's Committee (for most projects under 50 MW).
    - The Prime Minister (if the project is large, inter-provincial or over 1,000 ha).
  - Documents include:
    - Proposal.
    - Explanation of financial capacity.
    - Preliminary explanation of investment plan.
    - Legal documents of the Developer, etc.

This stage can be combined with the step "Investment project proposal with land-use" if there is a bidding process to select the Project Developer later.

4.1.1.4. *Investment project proposal with land-use (if any)*

- If the project requires land-use, a proposal must be submitted to the Provincial People's Committee, which includes:

- Clearly stating the location, land area, current land status, and land-use purpose.
- Stating the need to change land-use purpose (if any).

- After the approval, the next step will be to organize an investor selection bidding process.

4.1.1.5. *Selection of the Investor*

After the power project is included in PDP/Provincial Plan the competent authority, which is the Provincial Government in the majority of cases, will select an investor. If there are more than one interested developer, according to the Bidding Law 2023 and Decree No.23/2024/ND-CP the power project will be bid with the selection criterion will be the lowest tariff. The result of investor selection is a condition for land allocation and issuance of Investment Registration Certificate.

4.1.1.6. *Investment registration certificate*

The investor must apply for an Investment registration certificate (IRC) from the local investment registration authority (currently the Provincial Department of Finance) or the Ministry of Finance for major projects. The IRC officially registers the project, sets key milestones (e.g., Investment Decision, capital values, Commercial Operation Date - COD), and is a foundational document for all subsequent permits.

The investment registration certificates can be revised during project development and operation.

4.1.1.7. *Deposit*

After the Law for Investment, the Investor shall prepare a deposit for projects involving land use. The deposits vary from 3% for investment cost of less than 300 billion VND to 1% for investment cost of more than 1000 billion VND.

After deposit the Investor can process to the Step B: Project Development. The Investor may also contact to EVN to seek for the Intent approval for the Project Power Purchase Agreement (PPA).

4.1.1.8. *PPA intend approval*

The Developer should contact to EVN to seek for an approval for PPA intend. That is typically under purview of the Board of Directors of EVN group. The process of acquiring consent of EVN board of directors should finish in Step A, but may well develop into the step B in practice.

4.1.2. *Step B: Project development*

Flow chart for Step B: Project development is shown in following figure.

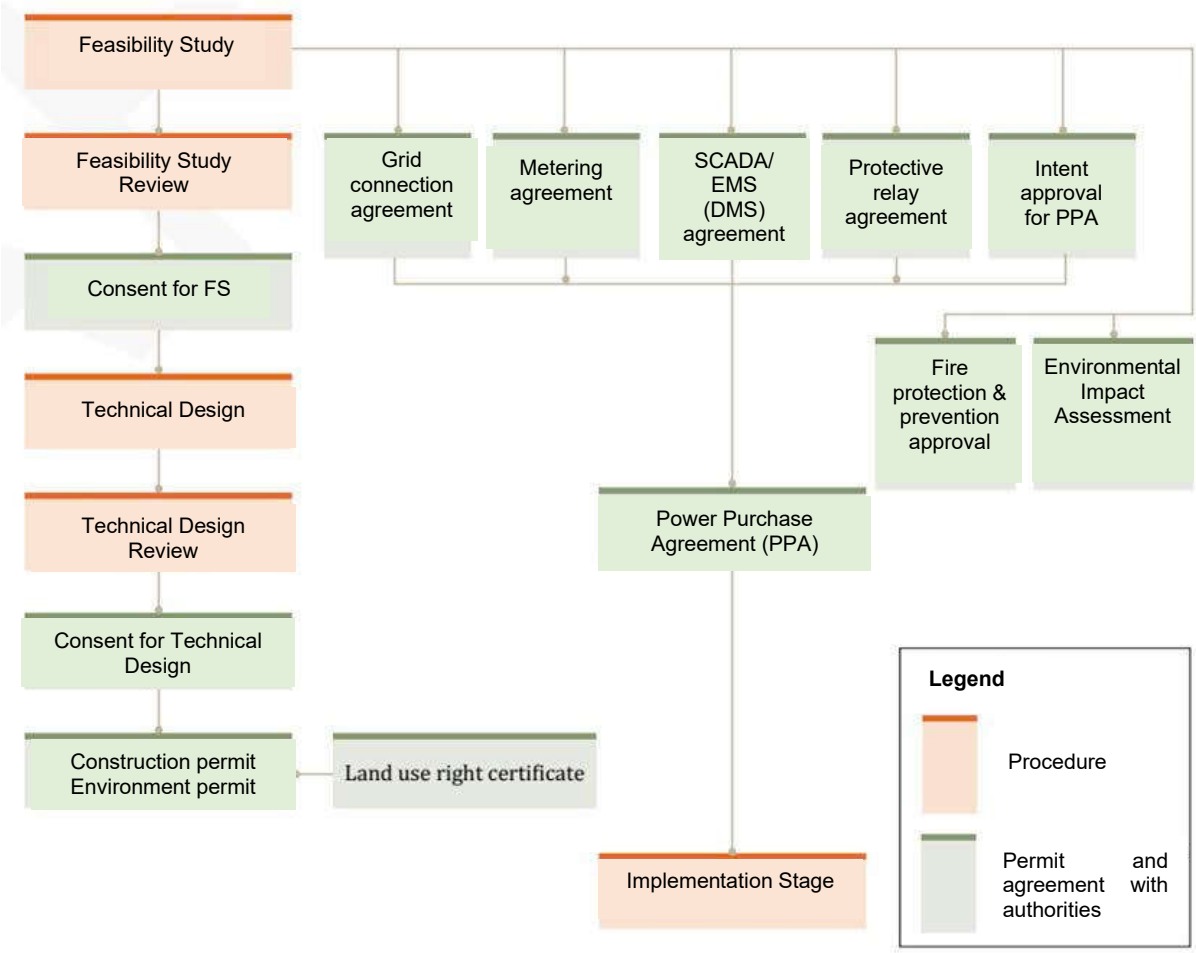

Figure 4-3: Stage B: Development[12]

4.1.2.1. *Feasibility Study/Basic Design*

For most power projects the Investor needs to implement a Feasibility Study (FS)/Basic Design and its review. The review is both internally organized by the Investor, and also externally by the competent authority. The Provincial Department of Industry and Trade or the Electric Authority of Vietnam will be the competent authority. If the Feasibility Study/Basic Design is satisfied by the authority, the authority will give a Notice of Review Results, which implicitly provide consent for technical and financial aspects of the FS.

Consent will also be required for Fire protection and prevention design by the Ministry of Public Security during this stage.

4.1.2.2. *Environmental Impact Assessment*

In parallel with the FS review, the Investor will also need to seek consent from the Authorities for Environment Impact Assessment (EIA). The process for EIA will be as follow:

[12] Refering to Chapter 4 of Decree No. 56/2025/NĐ-CP and Chapter 2 of Decree No. 175/2024/NĐ-CP

- Prepare an **environmental impact assessment (EIA) report** if the project belongs to this type (usually projects >1 MW or affecting ecosystems/forests). The EIA report in fact also covers the social impact assessment and mitigation plans. It should be noted that the EIA in Vietnamese regulations is significantly different from the international best practices.
- Submit to the Department of Agriculture and Environment or the Ministry of Agriculture and Environment for appraisal/approval (dependable on scale).
- The result is either an EIA approval decision or environmental license.

4.1.2.3. *EVN agreements*

The PPA will be based on a Template of Power Purchase Agreements. The standard period of the PPA is 20 years from the planned Commercial Operation Date. Possible pathways for PPA for the Lam Son project are discussed in sub-section 3.1.5. It is important to note that for the solar and wind projects under the FiT mechanism the PPAs have usually had a clause for curtailment due to grid congestion and low demand. The offtaker will not be responsible for loss of revenue due to such curtailment situations. Thus it is expected that there will be a risk of curtailment for the Lam Son project due to the availability of solar component if the same clause for FiT renewable projects is applied.

Various technical agreements with EVN will also be needed, such as grid connection, metering, Supervisory Control and Data Acquisition/Energy Management System (SCADA/EMS), protective relay before or after a PPA can be reached. These agreements should be finished before the technical design is approved.

4.1.2.4. *Technical Design*

After the FS process the Technical Design and Review will also need to be implemented after the Laws of Vietnam. The Client will be responsible for the review of the Technical Design. Nevertheless, similar to FS process, the Technical Design will also need to be given consent by the Competent Authority. Based on the scale of the project the Provincial Department of Industry and Trade or the Electric Authority of Vietnam will be the competent authority.

The Firefighting Department of the Ministry of Public Security will also review the technical design of fire prevention and firefighting systems.

4.1.2.5. *Land use certificates*

Those steps above provide the basis for land use certificate and various other permits required for the implementation stage. Before acquiring the land use certificate, the Investor need to make sure that the land and/or water surface areas required for construction of the project are assigned to be land/water area for power development in the land use plan of the province. The land use certificates should cover the required areas for permanent operation of the project plus safety belts around the project structural components.

If the land is not assigned to be for power development purposes, it will be necessary to convert the required areas. The competent authority for the approval of changing land use is the Provincial People Council or the Prime Minister or the National Assembly, depending on the scale and types of existing land use. The land use conversion decision should ideally be finished in Step A (preparation), but in practice it has been frequently in step B or even in Step C (project implementation).

Similarly, the land use certificates should be issued during this stage B. However, it has been common to receive it during the land clearance process in Step C.

4.1.3. *Step C: Investment implementation*

Flow chart for Steps C: Investment implementation, D: Operation and Maintenance, and E: Decommission is shown in following figure.

In order to for the project to be constructed, the Investor needs to secure three important items:

- Working drawing design (or detail design) is available.
- Land acquisition process is finished. That may include the resettlement and compensation, and Unexploded Ordnance (UXO) clearance.
- Funding for the project is available.

Testing and commissioning will require close collaboration from EVN. A certificate for Commercial Operation Date is required for activate the official purchase agreement with EVNEPTC. The project will also need to be consent for the Investor's Acceptance Process before official commission by the Competent Authority.

Electrical activity permits will also need to be issued by MOIT for the project operation. The permits will cover the operation of the plants and optionally the operation of the transmission lines to the grid nodes. The permits will be issued if certain conditions are met, such as number of qualified shift bosses for powerhouse operation.

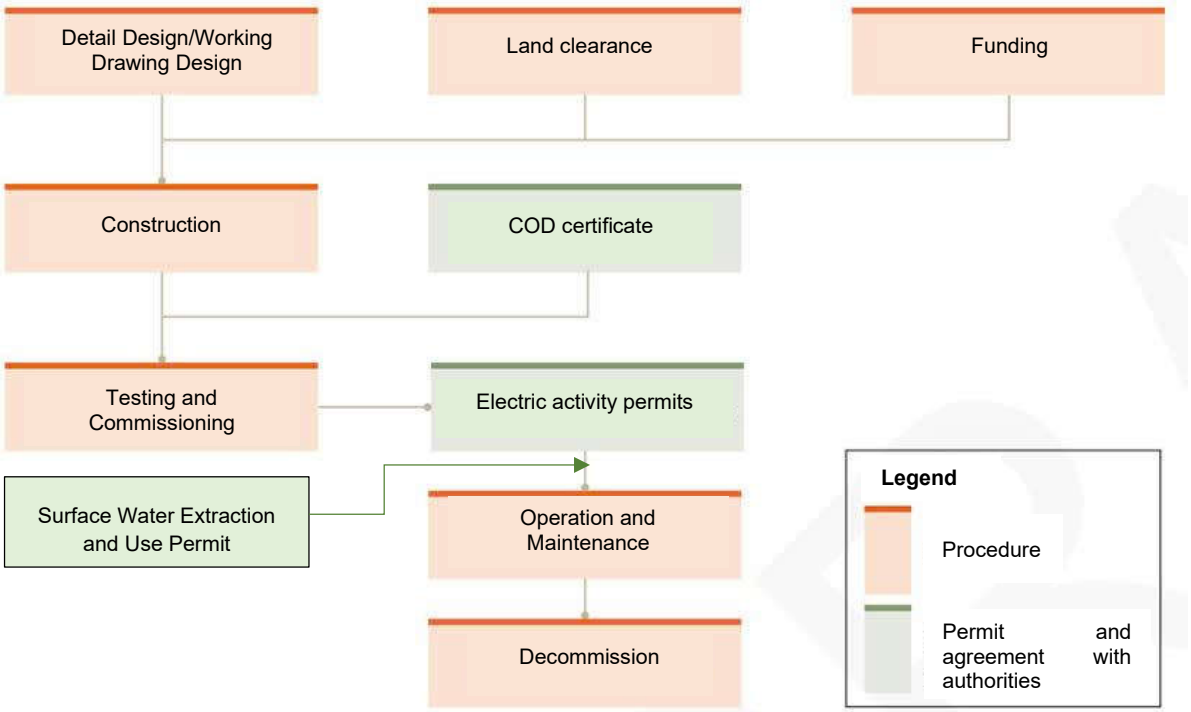

Figure 4-4: Stages C: construction, D: Operation and Maintenance, and E: Decommission[13]

In addition to the above permits for renewable energy projects, a Surface Water Extraction and Use Permit will be required for the Lam Son project before commissioning of the project. This will allow the project to utilize water from natural stream or existing reservoirs for pumped storage purpose.

4.1.4. *Step D: Operation and Maintenance*

The Operation and Maintenance stage will be continued through the project lifetime. It should be noted that the PPA and permits are issued with limited period of time. Thus the Investor will need to renegotiate for the new PPA, and submit for permit renewal to the authorities.

Notable milestone should be recognized early for major maintenance/overhaul of the equipment, and replacement at the end of equipment lifetime.

4.1.5. *Step E: Decommission*

The current Law of Electricity requires renewable energy projects (wind and solar power) will be dismantled after the end of the project lifetime. That will be an important factor for cost estimate and environmental management of the project.

4.2. Investment forms and procedures

4.2.1. *Investment forms and capital control mechanisms*

- Domestic investment.

[13] Refering to Chapter 5 of Decree No. 56/2025/NĐ-CP and Decree No. 06/2021/NĐ-CP

- Public-private partnership (PPP) investment.
- Investment with foreign elements.

4.2.2. *Project developer selection methods,*

Options for selecting project developers under Vietnamese law:

- Selecting investors through bidding
  - Legal basis: Article 22, Bidding Law 2013 stipulates bidding to select investors based on criteria of financial capacity, experience, techniques, and project implementation solutions.
- Designated bidding (Selecting investors through designated bidding)
  - Legal basis: Article 26, Bidding Law 2013 stipulates cases of designated bidding and specific applicable conditions.
- Selecting investors through competitive bidding
  - Legal basis: Article 32, Bidding Law 2013 stipulates competitive bidding, giving investors the opportunity to propose their own options or reasonable values for the project.
- Selecting investors through public-private partnership (PPP) contracts
  - Legal basis: Law on Investment under the form of PPP 2020 and decrees guiding the regulations on the process of selecting investors in PPP projects.
- Selecting investors in the form of strategic partners
  - Legal basis: Regulations on strategic partners can be stipulated in specific legal documents for each industry or each type of project, such as the Investment Law 2020.
- Selecting investors through the form of "combined bidding".

Unless the Developer can prove that the Lam Son complex is the urgent project, the developer selection of the project will likely under the bidding process.

4.2.3. *Identification of potential obstacles*

Difficulties in bidding for investor selection that may be encountered:

- The bidding requirement for power project is new, thus the authorities may lack clear legal guidance and experiences to implement.
- Ensuring transparency and fairness.
- Assessing the capacity and financial potential of investors.
- Forecasting and managing risks.
- Unfair competition.

- Difficulty in determining the correct objectives of the project.
- Complicated and delayed administrative procedures.
- Difficulty in monitoring progress and quality of implementation.
- Lack of real competition.
- Dispute and complaint resolution.

4.3. Project schedule and financial projection

It should be noted that the investment roadmap should be accompanied by the investment capital corresponding to each investment milestone. However, the investment capital can only have a preliminary value after completing Task 3, while Task 2 needs to be approved in advance. Therefore, the report for Task 2 can only provide regulations and investment progress estimates in the form of a framework. During the review process in Task 4 and completion in Task 5, the investment roadmap will be updated and completed in the final report

The investment roadmap will be based on the current laws and regulations on investment and development of power projects, especially the renewable energy sector. Since the Lam Son project has not been included in the PDP or the Provincial Development Plan, it will need to be added in those plans.

Based on PECC1's experience with similar scale projects, the timing of each investment milestone will be initially predicted in Figure 4-5. However, there is uncertainty for the process of project inclusion in the PDP VIII and provincial development plant and other approval processes. The Consultant will discuss with the PVP and the authorities about this project schedule later.

The allocation of investment capital, financial costs and funding sources will be determined for the proposed investment scenario as shown in Table 4-1. It should be noted that guidance by the Ministry of Construction of Vietnam requests the transmission cost to be distributed into the power source components instead of an independent work item. Thus this table follows the national guidance.

Another remark is that the value of the preliminary total cost estimate is slightly changed from that in the Task 3 due to update of cost distribution during construction period. The investment distribution during construction period without tax is shown in Table 4-2 as for financial projection purpose.

No.	Item	Year																																	
		2025		2026				2027				2028				2029				2030				2031				2032				2033				2034			
		III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
I.	**Step A: Preparation**																																				
1	Preparation of document for project inclusion in updated PDP VIII and its implementation plan																																				
2	Acceptance to the Provincial Development Plan																																				
3	Investment policy approval																																				
4	Preparation and bidding for the investor selection																																				
5	Investment approval																																				
6	Investment Registration Certificate																																				
7	Deposit account																																				
8	Intend approval for PPA by EVN																																				
II.	**Step B: Project Development**																																				
1	Feasibility Study/Basic Design																																				
2	Feasibility Study Review and Appraisal																																				
3	Consent and approval of Feasibility Study																																				
4	Enviromental Impact Assessment																																				
5	EIA Review and Appraisal																																				
6	Consent and approval of Enviromental Impact Assessment																																				
7	Grid connection agreement																																				
8	Metering Agreement																																				
9	SCADA Agreement																																				
10	Protection Role System Agreement																																				
11	Power Purchase Agreement																																				
12	Technical Design																																				
13	Technical Design Review and Appraisal																																				

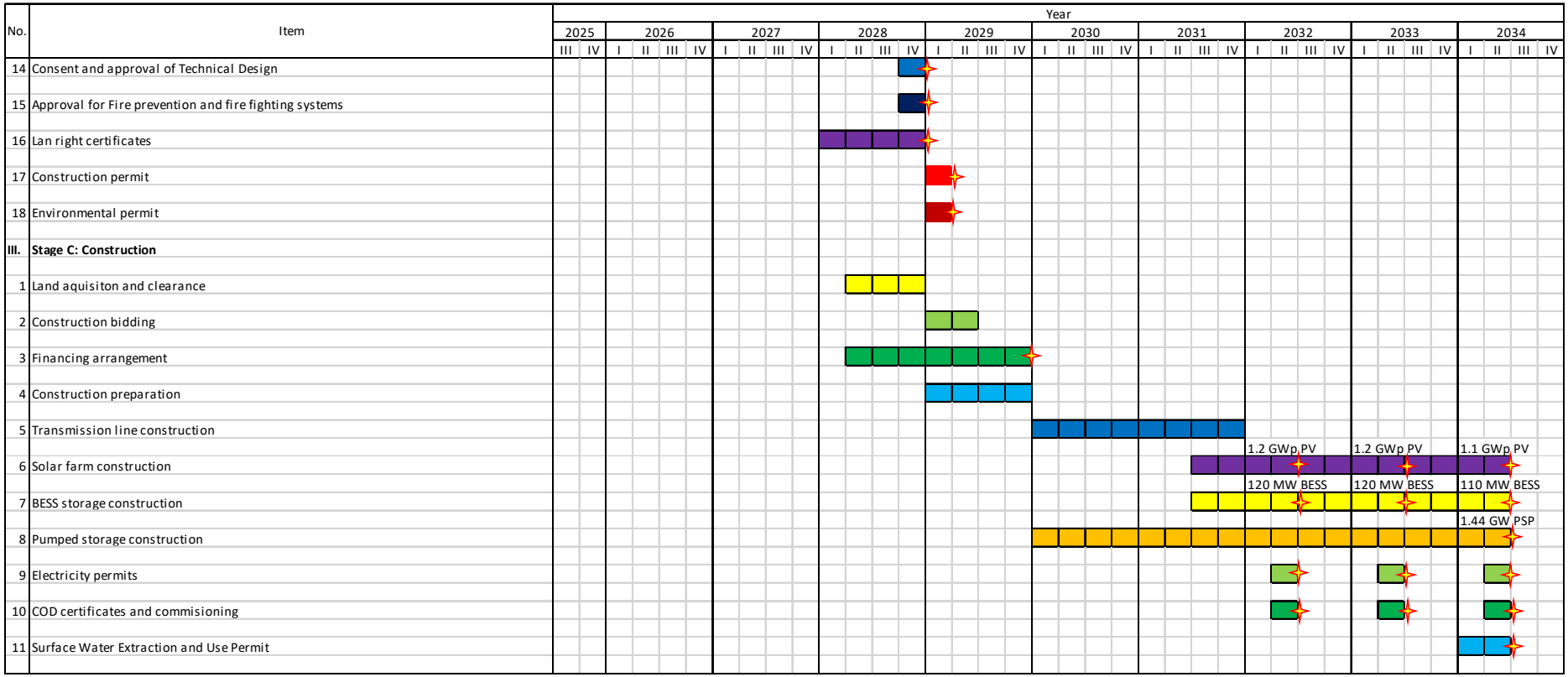

Figure 4-1: Preliminary project schedule

Table 4-1: Preliminary total cost estimation

No.	Cost items	Before-tax value, USD				VAT, USD	After-tax value, USD
		PSH (1440 MW)	PV (3500 MWp)	BESS (350 MW)	Total		
(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6) = (3)+(4)+(5)*	*(7) = (6)*10%*	*(8) = (6)+(7)*
1	**Compensation, support and resettlement cost**	**822,307**	**322,408,781**	**113,170**	**323,344,259**		**323,344,259**
2	**Construction cost**	**259,664,319**	**531,676,403**	**14,667,640**	**806,008,362**	**80,600,836**	**886,609,198**
2.1	Civil work	228,117,455	455,000,000	7,000,000	690,117,455	69,011,746	759,129,201
2.2	500Kv Connection line part	31,546,863	76,676,403	7,667,640	115,890,907	11,589,091	127,479,997
3	**Equipment cost**	**311,318,028**	**1,295,000,000**	**140,000,000**	**1,746,318,028**	**174,631,803**	**1,920,949,831**
4	**Overhead cost; consultancy cost for investment and construction and other costs**	**193,659,082**	**554,606,999**	**43,202,463**	**791,468,543**	**79,146,854**	**870,615,398**
4.1	Overhead cost; consultancy cost for investment and construction and other costs (excluding interest)	57,098,235	182,667,640	15,466,764	255,232,639	25,523,264	280,755,903
4.2	Interest during construction phase	136,560,847	371,939,359	27,735,699	536,235,904		536,235,904
5	**Contingency**	**125,780,578**	**466,350,565**	**34,049,515**	**626,180,658**	**62,618,066**	**688,798,723**
5.1	Contingency for arising quantity of 10% * item (1-4.1)	62,890,289	233,175,282	17,024,757	313,090,329	31,309,033	344,399,362
5.2	Contingency for price slippage of 10% * item (1-4.1)	62,890,289	233,175,282	17,024,757	313,090,329	31,309,033	344,399,362
	TOTAL	**891,244,314**	**3,170,042,748**	**232,032,788**	**4,293,319,850**	**396,997,559**	**4,690,317,409**

Table 4-2: Investment cost projection during construction period

No.	Cost items	Pretax investment cost (USD)	Preparation year (2029)	1st year of construction (2030)	2nd year of construction (2031)	3rd year of construction (2032)	4th year of construction (2033)	5th year of construction (2034)
1	Compensation, support and resettlement cost	**323,344,259**	41,115	48,501,639	96,921,047	96,962,162	80,836,065	82,231
2	Civil and equipment cost for pumped storage plan	**539,435,483**	11,405,873	34,217,618	45,623,491	119,292,969	212,688,378	116,207,154
3	Civil and equipment cost for solar farms	**1,750,000,000**		133,000,000	460,250,000	525,000,000	631,750,000	
4	Civil and equipment cost for BESS	**147,000,000**		8,050,000	37,100,000	44,100,000	57,750,000	
5	Cost for 500 kV grid connection	**115,890,907**		34,767,272	81,123,635			
6	Overhead cost; consultancy cost for investment and construction and other costs (excluding interest)	**255,232,639**	2,854,912	38,284,896	70,859,968	73,714,880	63,808,160	5,709,823
7	Contingency	**626,180,658**	2,860,380	59,364,285	158,375,628	171,814,002	209,366,520	24,399,842
	Total	**3,757,083,945**	**17,162,280**	**356,185,710**	**950,253,769**	**1,030,884,014**	**1,256,199,123**	**146,399,050**

5. RISK ASSESSMENT

Risks related to investment are listed in the following tables. The risks include construction schedule, curtailment, cost and financing, and legal aspects. The risks are qualitatively classified into three categories: Low, Medium and High and subjectively raking by the Consultant based on past experiences. It can be seen that the risks are either low or medium. The risk ranking will be subjected to be reviewed and modified after opinions by the Client and PVP and the Provincial authorities.

Table 5-1: Risks for construction schedule

No.	Risk description	Risk classification	Potential mitigation
1.	**Land acquisition and clearance**	**Medium**	- Early working with the provincial and local governments and affected people about acquisition policies, land use planning, permit procedures and compensation rates. - Prepare sufficient fund for land acquisition.
	Delay in land acquisition can cause construction delays and increase cost and reduce income	The project will require significant amount of land. The land acquisition process in Vietnam is complex, and time consuming. The local communities will object the land acquisition if their demands are not met.	
2.	**Construction schedule risk for solar farms**	**Low**	- Early land acquisition - Purchase equipment according to project schedule. - Spread construction over a certain period of type to avoid congestion from the equipment and material supplies. Use competent contractors.
	Delays in construction of solar farms will increase cost and reduce revenue.	Solar farms are simple to construction and quick for erection. However, the solar farm capacity is very large and require significant period of construction. There is also concern about supply of large quantities of solar panels from a single supplier in a very short time.	
3.	**Construction schedule risk for BESS**	**Low**	- Purchase equipment according to project schedule. - Use competent contractors.
	Delays in construction of solar farms will increase cost and reduce revenue.	BESS are simple to construction and quick for erection	
4.	**Construction schedule risk for Pumped Storage Plant**	**Low**	- Early land acquisition - Purchase equipment according to project schedule. - Use competent contractors.
		The PSP is similar to traditional hydropower plants, of which Vietnam	

No.	Risk description	Risk classification	Potential mitigation
		already has had a wealth of experiences	
5.	**Construction schedule risk for Connection system**	**Low**	- Early land acquisition - Purchase equipment according to project schedule. - Use competent contractors.
		Vietnam already has had a wealth of experiences in construction of 220 to 500 kV transmission lines and substations	

Table 5-2 Curtailment risk

No.	Risk description	Risk classification	Potential mitigation
1.	**Difference occurrences in peak demand and peak supply capacity**	**Medium**	Early construction for Pumped storage element need to be explored. Methods for shortening construction time are to be studied. Active weather prediction for solar power estimation for the short period of time to optimize the storage energy in the BESS and PSP, reducing solar generation exposure during low demand time.
	The peak demand from demand center and peak supply from renewable energy are different. At noon the peak supply from solar is generally highest, but demand can be below the supply capacity of the region. In this case the grid operator will impose a curtailment. Thus it can cause loss of revenue of the project due to curtailment.	Excessive generation of solar component of the project can be curtailed. The pumped storage element will be flexible and help the grid by absorbing solar power during day time and generating during night time. However due to the long construction period before commissioning of PSP this advantage effect of PSP will not be available.	
2.	**Risks of capacity release for the regional network**	**Medium**	Combined with other renewable investors to recommend MOIT to build new transmission grids earlier than PDP VIII, especially using HVDC transmission lines for better capacity transmission. Active weather prediction for solar power estimation for the short period of time to optimize the storage energy in the BESS and PSP, reducing solar generation exposure during congestion time.
	Regional grid capacity can lead to local congestion state in a certain period. In this case the grid operator will impose a curtailment. Thus it can cause loss of revenue of the project due to curtailment.	Excessive generation of solar component of the project can be curtailed. The pumped storage element will be flexible and help the grid by absorbing solar power during day time and generating during night time.	

Table 5-3: Financial risks

No.	Risk description	Risk classification	Potential mitigation
1.	**Cost overrun for solar farms**	**Low**	- Purchase equipment according to project schedule. - Use competent contractors. - Prepare sufficient cost contingencies.
	Solar cost higher than predicted can lead to cost overrun and low financial performance.	General costs for solar systems are on the downward trend worldwide.	
2.	**Cost overrun for BESS**	**Low**	- Purchase equipment according to project schedule. - Use competent contractors. - Prepare sufficient cost contingencies.
	BESS cost higher than predicted can lead to cost overrun and low financial performance.	General cost for BESS are on the downward trend worldwide.	
3.	**Cost overrun for PSP**	**Low**	- Purchase equipment according to project schedule. - Use competent contractors and suppliers. - Prepare sufficient cost contingencies.
	PSP cost higher than predicted can lead to cost overrun and low financial performance.	Construction cost for civil works and most of hydraulic equipment in Vietnam can be estimated after the National norms, which are reliable. Equipment cost can be referred to similar project, such as Bac Ai PSP	
4.	**Cost overrun for connection system**	**Low**	- Purchase equipment according to project schedule. - Use competent contractors and suppliers. - Prepare sufficient cost contingencies.
	Transmission cost higher than predicted can lead to cost overrun and low financial performance.	Construction cost for transmission system can be estimated after the National norms, which are reliable.	
5.	**Cost overrun for environmental and social compensation and mitigations**	**Medium**	- Early land acquisition. - Provision of sufficient contingencies for compensation. - Prepare sufficient cost contingencies.
	Environmental and social cost higher than predicted can lead to cost overrun and low financial performance.	Experiences in power projects in Vietnam show that compensation has been time consuming. Especially land acquisition can be costly over time. The local residents frequently have claimed for compensation for additional properties, which had not been available during survey	

No.	Risk description	Risk classification	Potential mitigation
6.	**Project financing**	**Low**	- PVP to acquire the development fund for green development for less costly financial loans. - Joint venture to be considered to share the financing risk.
	The project investment cost will be high. That can be a risk that the developer cannot find sufficient capital/loan for financing of the project	PVP is a subsidiary of PVP with robust financial health. There are available green development financing mechanism.	
7.	**Electricity tariff**	**Medium**	- Consult the MOIT about tariff mechanism. - Prepare sensitivity analysis about the project viability with different tariff scenarios.
	Low tariff can lead to low financial performance of the project.	Vietnam currently has separate tariffs for separate components of solar with and without BESS, and PSP. There has been no clear tariff mechanism for the combination of solar PV, BESS and PSP. The Circular No. 12/2025/TT-BCT allow FIRR 12% in estimate tariff for new types of energy generation.	

Table 5-4: Legal and policy risks

No.	Risk description	Risk classification	Potential mitigation
1.	**Inclusion into the Provincial development plan**	**Low**	- The PVP to submit the project for inclusion into the new provincial development plan. - If required adjust project scale to meet the overall provincial planning.
	Without inclusion in the provincial development plan, the project cannot be viable.	The Development Plan for the New Khanh Hoa Province is being prepared. Based on initial meeting with the Department of Industry and Trade of the new Khanh Hoa Province, the project meets the province objective for renewable energy development.	
2.	**Inclusion into the Power Development Plan**	**Medium**	- Timely submission of the project sot that it will be included in the updated implementation plan of the version of the PDP VIII. - The PVP to promote the project with MOIT and higher authority as an attractive option to costlier sources of energies. - As a backup plan the PVP to submit the project for
	Without inclusion in the power development plan, the project cannot be viable.	The project is not in the project list of implementation plan for PDP VIII (revisions). The project meets the national goals for renewable development and carbon emission reduction.	

No.	Risk description	Risk classification	Potential mitigation
			inclusion into the PDP IX plan.
3.	**Selection of the Developer**	**Medium**	- It is ideal that the project to be included into the list of emergency power projects so that it can circumvent the normal bureaucratic procedure. Thus PVP should explore that possibility with the MoIT and the province. - As a backup plan the PVP to prepare for a bid.
	PVP may not be selected for the project development	The project will likely to be tendered for the investor if it is not in the special mechanism. Cost of the project will be too high for a normal private investor, but certain big conglomerates in Vietnam can have enough capital for such a bid	
4.	**Changes in stimulus policy for renewable energies**	**Medium**	None, only prepare different financial and project developments and implement sensitivity analysis.
	The government may abolish the policy for stimulus of renewable energies. That will reduce the project attractive.	Renewable energies are now the most viable domestic sources of new supply. With projected strong increases in power demand and the need of energy security, renewable will be major contribution in the supply mix. Besides the European Union have been tightening carbon footprint for import products with a clear target for the foreseen future. That will have impacts to all exporting countries, including Vietnam. Thus Vietnam will have to reduce carbon emission to keep export competiveness. Therefore, it will be less likely that the stimulus intent for renewable energy development will be changed. However, adjustments, such as requirements for more competition of the renewable will likely be enforced. Sudden changes in regulation for COD conditions have had significant impacts for renewable energy development	

APPENDIX 1. LIST OF PLANNED POWER PROJECTS IN FORMER NINH THUAN PROVINCE LISTED IN THE IMPLEMENTATION PLAN OF REVISED POWER DEVELOPMENT PLAN VIII

Power supplies

List of planned LNG thermal power

No.	Project name	Planned capacity (MW)	COD	Remark
1	LNG Ca Na	1500	2028	

List of planned pumped storage projects

No.	Project name	Planned capacity (MW)	COD	Remark
1	Bac Ai	1200	2028-2029	Included PDP VIII
2	Phuoc Hoa	1200	2029-2030	Included PDP VIII

List of planned on-shore and near shore wind power projects

No.	Project name	Planned capacity (MW)	COD
1	Phuoc Huu wind power plant	50	2023-2025
2	Phuoc Nam - Enfinity - Ninh Thuan renewable energy plant	65	2023-2025
3	BIM Wind power plant 2nd stage expansion	50	2023-2025
4	Tri Hai Wind power plant	39.5	2025
5	A capacity portion of Hanbaram Wind power plant	93	2023-205
6	V2 Wind power plant	40	2026-2030
7	Wind Power Tri Hai Wind Power (2nd stage 2)	39.5	2025-2030
8	Bac Son Wind Power	60.5	2025-2030
9	Nui Mot reservoir Wind Power	50	2025-2030
10	BIM Wind Power expansion, 3rd stage	120	2025-2030
11	V2 Wind Power - expansion	769	2025-2030

List of planned solar power projects

No.	Project name	Capacity, MW	
		2025-2030	2031-2035
1	Phuoc Thai 2 Solar Power	87	
2	Phuoc Thai 3 Solar Power	43.5	
3	Phuoc Huu 2 Solar Power	184	
4	Phuoc Trung Solar Power	40	
5	Bac Ai 7 Solar Power on Song Cai reservoir	70	
6	Nhi Ha Solar Power	80	
7	Song Sat reservoir Solar Power	70	
8	Dong Quan The Solar Power Plant	250	
9	Mi Son - Hoan Loc Viet Solar Power - stage 2	50	
10	Hacom Solar Power - stage 2	50	
11	CK7 reservoir Solar Power	50	
12	Ninh Phuoc 6.3 Solar Power	50	
13	Song Than Reservoir Solar Power	50	
14	Hoa Son Doc Dai Solar Power	400	
15	Bac Ai 1 Solar Power	150	
16	Ninh Son 1 Solar Power	73.5	
17	Dong Quan The 2 Solar Power Plant	50	
18	Hoa Son Suoi Ong 4 Solar Power	350	
19	Phuoc Ninh expansion Solar Power - stage 2	50	
20	Nhi Ha Solar Farm - stage 2		50
21	CK7 reservoir Solar Power - Stage 2		100
22	Ninh Phuoc 7 Solar Power -		200
23	Dong Quan The 2 Solar Power Plant - Stage 2		50
24	Hoa Son Suoi Ong 4 Solar Power		50
25	Bac Ai 7 Solar Power on Song Cai reservoir		60
26	Ninh Phuoc Solar Power		276
27	Ba Rau Reservoir Solar Power		80
28	Phuoc Ninh expansion Solar Power - stage 2		38

No.	Project name	Capacity, MW	
		2025-2030	2031-2035
29	Tra Co Reservoir Solar Power		40
30	7A Solar Power		50
31	Cho Mo Reservoir Solar Power		80
32	Nhi Ha Solar Power - Stage 2		150
33	Nui Mot 2 Reservoir Solar Power		80
34	Tan Giang Reservoir Solar Power		50
35	Ta Ranh Reservoir Solar Power		39.5
36	Thuan Nam 11 Solar Power		50
37	Hon Kho Solar Power		120
38	Bac Ai 14 Solar Power Plant		80
39	Hieu Thien Solar Power Plant		120
40	Phuoc Chien Solar Power Plant		200
41	Tay Quan The Solar Power Plant		100
42	Tri Hai Solar Power Plant		100
43	Nhi Ha 5 Solar Power combined with green hydrogen generation project		160
44	Thuan Nam 1 Solar Power combined with green hydrogen generation project		140
45	Ninh Son 2 Solar Power Plant		90
46	Bac Ai 2 Solar Power Plant		160
47	Bac Ai 3 Solar Power Plant		200
48	Nhi Ha Solar Power Plant		100
49	Thai Vinh 1 Solar Power Project		120
50	Thai Vinh 2 Solar Power Project		120
51	Quang Son 2 Solar Power Project		96
52	Thai Vinh 2 Solar Power Plant		120
	Total	**2148**	**3469.5**

List of planned offshore wind power projects in the South-Central Region by 2035

No.	Zone	Planned capacity (MW)	Planned combination		Connection substation	COD
			Component project name	Capacity (MW)		
	South-Central Region	4300				
1	South-Central 1	2000	South-Central 1.1	500	NTB1	2025-2030
			South-Central 1.2	500	NTB1	2025-2030
			South-Central 1.3	500	NTB1	2025-2030
			South-Central 1.4	500	NTB1	2031-2035
2	South-Central 2	1000	South-Central 2.1	500	NTB2	2025-2030
			South-Central 2.2	500	NTB2	2031-2035
3	South-Central 3	1300	South-Central 3	1300	NTB3	2031-2035

List of planned large hydropower project

No.	Project	Planned capacity (MW)	COD
1	Da Nhim Expansion (2nd stage)	80	2025-2030

List of small large hydropower projects

No.	Project	Location	Planned capacity (MW)	COD
I	Total		40	
1	Phuoc Hoa	Bac Ai District	22	2026-2030
2	Thuong Song Ong 2	Ninh Son District	7	2026-2030
3	Lam Son	Ninh Son District	11	2026-2030

List of planned nuclear power projects

No.	Project	Planned capacity (MW)	COD
1	Ninh Thuan 1	2.000 - 3.200	2030-2035
2	Ninh Thuan 2	2.000 - 3.200	2030-2035

Transmission systems

List of new and upgraded 500 kV substations

No.	Project	Capacity (MVA)	Remark	State investment	Socialized investment
I	**2025-2030**				
1	Thuan Nam	2700	Upgrade		x
2	Ninh Son	2700	New, flexible scheme design	x	
3	NTB 1	2700	New, adaptation for scale and schedule of offshore projects in South-Central region		x
II	**2031-2035**				
1	500 kV Ninh Thuan 1	1800	New, solving grid curtailment for renewable energies		x
2	500 kV Ninh Thuan 2	1800	New, solving grid curtailment for renewable energies		x

List of new and upgrade 500 kV transmission lines

No.	Project Name	Circuit x km	Remark	State investment	Socialized investment
I	**2025-2030**				
1	Ninh Son - Van Phong I thermal plant - Thuan Nam	4 x 18	New, connecting 500 kV Ninh Son substation	x	
2	Ninh Son - Chon Thanh	2 x 275	New, solving grid curtailment for power supply.	x	
3	Bac Ai PSP - Ninh Son	2 x 25	New, synchronized with Bac Ai PSP	x	
4	Phuoc Hoa PSP - Ninh Son	2 x 25	New, synchronized with Phuoc Hoa PSP		x
5	Connection for Ninh Thuan 1 Nuclear Plant (release to Southern Region)	2 x 300	New, synchronized with Ninh Thuan 1 nuclear plant. Connection considered to 500 kV Binh Duong 1	x	

No.	Project Name	Circuit x km	Remark	State investment	Socialized investment
			substation. Considered of 765 - 1000 kV in case of high supply development in South Central		
6	Connection for Ninh Thuan 1 Nuclear Plant	4 x 15	New, synchronized with Ninh Thuan 1 nuclear plant. Connection considered to 500 kV Thuan Nam - Vinh Tan transmission line	x	
7	Connection for Ninh Thuan 2 Nuclear Plant	2 x 60	New, synchronized with Ninh Thuan 2 nuclear plant. Connection considered to 500 kV Ninh Son substation.	x	
8	Connection for Ninh Thuan 2 Nuclear Plant (release to Southern Region)	2 x 325	New, synchronized with Ninh Thuan 2 nuclear plant. Connection considered to 500 kV Binh Duong 2 substation. Considered of 765 - 1000 kV in case of high supply development in South Central	x	
9	NTB 1 - Hong Phong	2 x 20	New, adaptation for scale and schedule of offshore projects in South-Central region		x
10	LNG Ca Na - Thuan Nam	2 x 30	New, synchronized with LNG Ca Na		x
II	**2031-2035**				
1	500 kV Ninh Thuan 1 - Van Phong - Ninh Son	2 x 50	New, synchronized with scale and schedule of supply in area		x
2	500 kV Ninh Thuận 2 - Thuan Nam - Ninh Son	2 x 50	New, synchronized with scale and schedule of supply in area. Considered for changing connection to		x

No.	Project Name	Circuit x km	Remark	State investment	Socialized investment
			Nam Trung Bo HVDC converter substation when Nam Trung Bo - Bac Bo HVDC transmission system occurs		
3	Connection of Nam Trung Bo HVDC converter substation	160	New, Connection of Nam Trung Bo HVDC converter substation, Considered for connection to Ninh Thuan 1 and 2 nuclear plants	x	
4	Don Duong PSP - Ninh Thuan 2 Nuclear Plant - Binh Duong 2	4 x 20	New, synchronized with Don Duong PSP	x	

List of new and upgraded 220 kV substations

No.	**Project**	**Capacity (MVA)**	**Remark**	**State investment**	**Socialized investment**
I	**2025-2030**				
1	Da Nhim HPP	375	Upgrade		x
2	Phuoc Thai	750	Upgrade	x	
3	Da Nhim Switchyard	Switchyard	New	x	
4	Ca Na	500	New	x	
5	Dông Quan The	480	New, synchronized with specific load		x
II	**2031-2035**				
1	220 kV Ninh Thuan 1	750	New, solving grid curtailment for renewable energies		x
2	220 kV Ninh Thuan 2	750	New, solving grid curtailment for renewable energies		x

No.	Project	Capacity (MVA)	Remark	State investment	Socialized investment
3	220 kV Ninh Thuan 3	750	New, solving grid curtailment for renewable energies		x

List of new and upgrade 220 kV transmission lines

No.	Project Name	Circuit x km	Remark	State investment	Socialized investment
I	**2025-2030**				
2	220 kV Da Nhim switchyard - Thap Cham - Da Nhim	2 x 1	New, synchronized with 220 kV Da Nhim switchyard	x	
3	220 kV Da Nhim switchyard - Duc Trong - Di Linh	2 x 96	New, grid curtailment solution for power supply in the area	x	
11	500 kV Ninh Son - Thap Cham - Ninh Phuoc	4 x 27	New, connection to 500 kV Ninh Son substation	x	
12	500 kV Ninh Son - Ninh Phuoc	2 x 47	New	x	
13	500 kV Ninh Son - 220 kV Da Nhim switchyard	2 x 18	New, grid curtailment solution for power supply in the area	x	
14	Thap Cham - 220 kV Da Nhim switchyard	2 x 46	New, grid curtailment solution for power supply in the area	x	
15	220 kV Vinh Tân - Ca Na	2 x 14	New, connection to 220 kV Ca Na substation	x	
16	Phuoc Huu Wind Power Plant - 220 kV Ninh Phuoc	1 x 2	New, connection to Phuoc Huu wind farm, 220 kV Phuoc Huu step-up substation has capacity of 63 MVA		x
17	Dong Quan The - Vinh Tan - 220 kV Quan The Switchyard	2 x 1	New, synchronized with schedule of specific load demand development		x

No.	Project Name	Circuit x km	Remark	State investment	Socialized investment
18	Dong Quan The - Ca Na	1 x 7	New, synchronized with schedule of specific load demand development		x
19	Da Nhim Expansion – 2nd stage - 220 kV Da Nhim Switchyard	1 x 1	New, synchronized with project.		x

APPENDIX 2: SUMMARY OF INVESTMENT PREPARATION STEPS

No.	Work content	Results/papers
1	Planning check	Planning confirmation document
2	Survey - connection	Preliminary connection agreement
3	Application for investment policy	Decision on investment policy approval
4	EIA/Environment	Decision on EIA approval/environmental license
5	Land-use proposal	Decision on land-use location approval
6	Bidding (if any)	Decision on investor selection
7	Preliminary technical dossiers	FS report, preliminary basic design

A complete procedure of steps to implement an energy (electricity) investment project in Vietnam is listed herewith which is updated according to the latest laws and decrees:

- Investment Law 2020 (revised and supplemented 2022-2024)
- Electricity Law 2024 (effective from February 1, 2025)
- Bidding Law 2023
- Land Law 2024
- Environmental **Protection Law 2020**

Investment preparation phase

Step	Contents	Legal bases
1	Survey, site selection and planning check (PDP VIII, provincial planning)	Electricity Law 2024, PDP8
2	Connection agreement with power system operators (A0, A1, etc.)	Circular No. 25/2023/TT-BCT
3	Dossiers application for investment policy approval	Investment Law 2020
4	Environmental impact assessment (EIA) report preparation or environmental license	Environmental Protection Law 2020
5	Submission of land-use/water surface use project proposals → Provincial People's Committee	Land Law 2024
6	Organization of investor selection bidding (if various developers interested in the project)	Bidding Law 2023, Decree No.23/2024
7	Investment policy approval decision or investment registration certificate granting	Investment Law 2020
8	Basic Design, FS report preparation and approval	Revised Construction Law 2014
9	Application for construction permit (if any)	Decree No. 15/2021/NĐ-CP

Investment implementation phase

Step	Contents	Remark
10	**Power purchase agreement (PPA) or direct power purchase agreement (DPPA) signing** with EVN or Client	Competitive power market mechanism applied
11	**Project construction** (upon obtaining all required licenses/permits)	Can be divided into EPC phases
12	**Construction supervision, quality control, safety management**	Pursuant to Construction Law & sector standards
13	**Power project completion acceptance**	Pursuant to Decree No.06/2021/NĐ-CP
14	**Grid connection, equipment testing and calibration**	Monitored by A0, A1, etc.
15	**Application for Electricity Operation License**	Pursuant to Decree No.61/2025/NĐ-CP (expected)
16	**Registration for Commercial Operation Date (COD)**	As per PPA/DPPA

Operation and maintenance phase

Step	Contents	Remark
17	**Commercial Operation, agreement on output, payment**	As per PPA or power market
18	**Period report on environment, technique, safety, etc.**	Submission to Department of Agriculture & Environment, MOIT
19	**Energy audit (for big projects)**	Applied as per term
20	**License extension/revision/supplement in case of changes**	Power Law 2024, Decree No.61/2025
21	**Project liquidation, transfer, termination (if any)**	Must be accepted by the State authorities

APPENDIX 3: RESULTS OF ECONOMIC AND FINANCIAL ANALYSIS

Economic analysis

Calculation for levelized cost of energy

Capital (Mil. USD)	Interest rate	Repayment period	Drawdown period	Total	-6	-5	-4	-3	-2	-1
Commercial - PV + BESS	10,00%	10	4	946,4		141,96	283,91	283,91	236,59	
Borrow foreign currency to buy PV+BESS equipment	7,00%	16	4	1722,0		86,10	430,50	516,60	688,80	
Commercial Loan - PSH	10,00%	10	5	256,2		54,62	50,78	58,54	57,32	34,96
Borrow foreign currency to buy PSH equipment	7,00%	11	3	373,6				74,72	186,79	112,07
Equity	12,00%			343,0	17,48	35,27	94,04	103,75	92,49	

Year	Total	-6	-5	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
COST (million USD)																								
InvesCommercialent capital	**3757,08**	17,5	352,7	940,4	1037,5	1262,0	147,0																	
Foreign currency interest payment	**1356,22**		3,01	21,09	56,86	108,20	140,88	136,68	126,77	116,86	106,95	97,03	87,12	77,21	67,30	57,39	47,48	37,57	28,25	20,72	13,18	5,65		
Construction interest	*211,39*		3,01	21,09	56,86	108,20	22,23																	
Operating profit	*1144,82*						118,66	136,68	126,77	116,86	106,95	97,03	87,12	77,21	67,30	57,39	47,48	37,57	28,25	20,72	13,18	5,65		
Loan fees	**24,40**		12,75	3,28	5,57	2,43	0,37																	
Disassembly costs	**145,90**																							
Replace equipment	**1964,05**																140,00							
OM cost	**1703,45**				11,89	23,78	35,66	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80
PV + BESS 1.8% (civil + equipment)	*1497,90*				*11,89*	*23,78*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*
PSH 0.9% (civil + equipment)	*205,55*							*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*
Total	**8951,11**	**17,48**	**368,47**	**964,73**	**1111,8**	**1396,4**	**323,95**	**177,48**	**167,57**	**157,66**	**147,75**	**137,84**	**127,93**	**118,02**	**108,10**	**98,19**	**228,28**	**78,37**	**69,05**	**61,52**	**53,99**	**46,45**	**40,80**	**40,80**
Present Value (PV) of Cost (mil.USD)	**3631,9**	**15,9**	**304,5**	**724,8**	**759,4**	**867,1**	**182,9**	**91,1**	**78,2**	**66,9**	**57,0**	**48,3**	**40,8**	**34,2**	**28,5**	**23,5**	**49,7**	**15,5**	**12,4**	**10,1**	**8,0**	**6,3**	**5,0**	**4,6**
ELECTRICITY (Mil. kWh)	**185917,269**				**1816,1**	**3615,0**	**5396,5**	**4644,4**	**4630,9**	**4615,3**	**4597,9**	**4577,5**	**4554,0**	**4526,2**	**4497,5**	**4469,3**	**4440,2**	**4414,5**	**4392,4**	**4372,0**	**4352,8**	**4334,2**	**4318,5**	**4305,0**
Present value of output	**31201,3**				**1240,4**	**2244,6**	**3046,2**	**2383,3**	**2160,4**	**1957,3**	**1772,7**	**1604,4**	**1451,1**	**1311,1**	**1184,3**	**1069,9**	**966,3**	**873,4**	**790,0**	**714,8**	**647,0**	**585,7**	**530,5**	**480,8**
Year		**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
COST (million USD)																								
Disassembly costs			145,90																					
Replace equipment				1435,0	249,05										140,00									
OM cost		40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80	40,80
PV + BESS 1.8% (civil + equipment)		*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*	*35,66*
PSH 0.9% (civil + equipment)		*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*	*5,14*
Total		**40,80**	**186,71**	**1475,8**	**289,86**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**180,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**	**40,80**
Present Value (PV) of Cost (mil.USD)		**4,1**	**17,2**	**123,8**	**22,1**	**2,8**	**2,6**	**2,3**	**2,1**	**1,9**	**1,8**	**1,6**	**1,5**	**1,3**	**5,3**	**1,1**	**1,0**	**0,9**	**0,8**	**0,7**	**0,7**	**0,6**	**0,6**	**0,5**
ELECTRICITY (Mil. kWh)		**4290,3**	**3419,0**	**3404,4**	**3715,5**	**4630,9**	**4615,3**	**4597,9**	**4577,5**	**4554,0**	**4526,2**	**4497,5**	**4469,3**	**4440,2**	**4414,5**	**4392,4**	**4372,0**	**4352,8**	**4334,2**	**4318,5**	**4305,0**	**4290,3**	**4273,8**	**4255,5**
Present value of output		**435,6**	**315,6**	**285,6**	**283,4**	**321,1**	**290,9**	**263,5**	**238,5**	**215,7**	**194,9**	**176,0**	**159,0**	**143,6**	**129,8**	**117,4**	**106,3**	**96,2**	**87,1**	**78,9**	**71,5**	**64,7**	**58,6**	**53,1**
LCOE (USD/MWh)	**116,40**																							

Calculation for economic indexes - Option 1: without carbon credit values

Project parameters			
Capacity MW	5300	Selling price (USD/MWh)	
Eo mil.kWh	4474,4	**O&M PM = 1.8%(civil + equipment) million USD**	35,66
Investment (million USD)	3757,08	**O&M PSH = 0.9%(civil + equipment) million USD**	5,14
Discount	10%	**Construction period (year)**	6
Self used loss	0,7%	**Project lifetime (year)**	40

Economic indicators		LNG gas power plant		
Emission factor (tCO2/MWh)	0,659		*VND/Kwh*	*cents/kWh*
CO2 credit selling price (USD/tCO2)		Electricity tariff	3327,42	12,57
		NPV (tr USD)		468,95
		IRR (%)		11,98
Exchange rate (VND/USD)	26.466	B/C		1,14

	EXPENSE (COST)					BENEFIT				
Year	Investment (million USD)	O&M (mil.USD)	Replacement and dismantling costs (mil.USD)	Foreign currency interest and fees (mil.USD)	Total C (mil.USD)	Etm (mil.kWh)	Revenue from selling CO2 credits (mil.USD)	Revenue (mil.USD)	Total B1 (mil.USD)	B - C
1	17.16	0.00	0.00	0.00	17.16	0.00	0.00	0.00	0.00	-17.16
2	356.19	0.00	0.00	14.09	370.27	0.00	0.00	0.00	0.00	-370.27
3	950.25	0.00	0.00	20.98	971.23	0.00	0.00	0.00	0.00	-971.23
4	1030.88	11.89	0.00	52.35	1095.13	1816.14	0.00	228.33	228.33	-866.79
5	1256.20	23.78	0.00	92.19	1372.17	3614.98	0.00	454.49	454.49	-917.68
6	146.40	35.66	0.00	116.77	298.84	5396.52	0.00	678.47	678.47	379.64
7	0.00	40.80	0.00	109.14	149.94	4644.40	0.00	583.91	583.91	433.97
8	0.00	40.80	0.00	96.92	137.72	4630.93	0.00	582.22	582.22	444.50
9	0.00	40.80	0.00	84.69	125.50	4615.29	0.00	580.25	580.25	454.76
10	0.00	40.80	0.00	72.47	113.27	4597.91	0.00	578.07	578.07	464.80
11	0.00	40.80	0.00	60.24	101.05	4577.48	0.00	575.50	575.50	474.45
12	0.00	40.80	0.00	48.02	88.82	4554.02	0.00	572.55	572.55	483.73
13	0.00	40.80	0.00	35.80	76.60	4526.21	0.00	569.05	569.05	492.46
14	0.00	40.80	0.00	23.57	64.37	4497.53	0.00	565.45	565.45	501.07
15	0.00	40.80	0.00	11.35	52.15	4469.29	0.00	561.90	561.90	509.75
16	0.00	40.80	140.00	1.63	182.44	4440.18	0.00	558.24	558.24	375.80
17	0.00	40.80	0.00	0.00	40.80	4414.54	0.00	555.02	555.02	514.21
18	0.00	40.80	0.00	0.00	40.80	4392.38	0.00	552.23	552.23	511.43
19	0.00	40.80	0.00	0.00	40.80	4371.96	0.00	549.66	549.66	508.86
20	0.00	40.80	0.00	0.00	40.80	4352.84	0.00	547.26	547.26	506.45
21	0.00	40.80	0.00	0.00	40.80	4334.15	0.00	544.91	544.91	504.11
22	0.00	40.80	0.00	0.00	40.80	4318.51	0.00	542.94	542.94	502.14
23	0.00	40.80	0.00	0.00	40.80	4305.04	0.00	541.25	541.25	500.45
24	0.00	40.80	0.00	0.00	40.80	4290.27	0.00	539.39	539.39	498.59
25	0.00	40.80	145.90	0.00	186.71	3419.00	0.00	429.85	429.85	243.15
26	0.00	40.80	1435.00	0.00	1475.80	3404.41	0.00	428.02	428.02	-1047.79
27	0.00	40.80	249.05	0.00	289.86	3715.52	0.00	467.13	467.13	177.27
28	0.00	40.80	0.00	0.00	40.80	4630.93	0.00	582.22	582.22	541.42
29	0.00	40.80	0.00	0.00	40.80	4615.29	0.00	580.25	580.25	539.45
30	0.00	40.80	0.00	0.00	40.80	4597.91	0.00	578.07	578.07	537.27

	EXPENSE (COST)					BENEFIT				
Year	Investment (million USD)	O&M (mil.USD)	Replacement and dismantling costs (mil.USD)	Foreign currency interest and fees (mil.USD)	Total C (mil.USD)	Etm (mil.kWh)	Revenue from selling CO2 credits (mil.USD)	Revenue (mil.USD)	Total B1 (mil.USD)	B - C
31	0.00	40.80	0.00	0.00	40.80	4577.48	0.00	575.50	575.50	534.70
32	0.00	40.80	0.00	0.00	40.80	4554.02	0.00	572.55	572.55	531.75
33	0.00	40.80	0.00	0.00	40.80	4526.21	0.00	569.05	569.05	528.25
34	0.00	40.80	0.00	0.00	40.80	4497.53	0.00	565.45	565.45	524.65
35	0.00	40.80	0.00	0.00	40.80	4469.29	0.00	561.90	561.90	521.10
36	0.00	40.80	0.00	0.00	40.80	4440.18	0.00	558.24	558.24	517.44
37	0.00	40.80	140.00	0.00	180.80	4414.54	0.00	555.02	555.02	374.21
38	0.00	40.80	0.00	0.00	40.80	4392.38	0.00	552.23	552.23	511.43
39	0.00	40.80	0.00	0.00	40.80	4371.96	0.00	549.66	549.66	508.86
40	0.00	40.80	0.00	0.00	40.80	4352.84	0.00	547.26	547.26	506.45
41	0.00	40.80	0.00	0.00	40.80	4334.15	0.00	544.91	544.91	504.11
42	0.00	40.80	0.00	0.00	40.80	4318.51	0.00	542.94	542.94	502.14
43	0.00	40.80	0.00	0.00	40.80	4305.04	0.00	541.25	541.25	500.45
44	0.00	40.80	0.00	0.00	40.80	4290.27	0.00	539.39	539.39	498.59
45	0.00	40.80	0.00	0.00	40.80	4273.76	0.00	537.32	537.32	496.51
46	0.00	40.80	0.00	0.00	40.80	4255.51	0.00	535.02	535.02	494.22
			0.00	0.00						

Calculation for economic indexes - Option 2: with carbon credit values

Project parameters				Economic indicators			LNG gas power plant	
Capacity MW	5300	Selling price (USD/MWh)		Emission factor (tCO2/MWh)	0,659		*VND/Kwh*	*cents/kWh*
Eo mil.kWh	4474,4	**O&M PM = 1.8%(civil + equipment) million USD**	35,66			Electricity tariff	3327,42	12,57
Investment (million USD)	3757,08	**O&M PSH = 0.9%(civil + equipment) million USD**	5,14	CO2 credit selling price (USD/tCO2)	7,5	NPV (tr USD)		623,20
Discount	10%	**Construction period (year)**	6			IRR (%)		12,63
Self used loss	0,7%	**Project lifetime (year)**	40	Exchange rate (VND/USD)	26.466	B/C		1,18

Source of reference on CO2 credit selling price (7.5 USD/t CO2)[14]

	EXPENSE (COST)						BENEFIT			
Year	Investment (million USD)	O&M (mil.USD)	Replacement and dismantling costs (mil.USD)	Foreign currency interest and fees (mil.USD)	Total C (mil.USD)	Etm (mil.kWh)	Revenue from selling CO2 credits (mil.USD)	Revenue (mil.USD)	Total B1 (mil.USD)	B - C
1	17.16	0.00	0.00	0.00	17.16	0.00	0.00	0.00	0.00	-17.16
2	356.19	0.00	0.00	14.09	370.27	0.00	0.00	0.00	0.00	-370.27
3	950.25	0.00	0.00	20.98	971.23	0.00	0.00	0.00	0.00	-971.23
4	1030.88	11.89	0.00	52.35	1095.13	1816.14	8.98	228.33	237.31	-857.81
5	1256.20	23.78	0.00	92.19	1372.17	3614.98	17.87	454.49	472.36	-899.81
6	146.40	35.66	0.00	116.77	298.84	5396.52	26.68	678.47	705.15	406.32
7	0.00	40.80	0.00	109.14	149.94	4644.40	22.96	583.91	606.88	456.93
8	0.00	40.80	0.00	96.92	137.72	4630.93	22.90	582.22	605.12	467.40
9	0.00	40.80	0.00	84.69	125.50	4615.29	22.82	580.25	603.07	477.58
10	0.00	40.80	0.00	72.47	113.27	4597.91	22.73	578.07	600.80	487.53
11	0.00	40.80	0.00	60.24	101.05	4577.48	22.63	575.50	598.13	497.08
12	0.00	40.80	0.00	48.02	88.82	4554.02	22.52	572.55	595.07	506.24
13	0.00	40.80	0.00	35.80	76.60	4526.21	22.38	569.05	591.43	514.83
14	0.00	40.80	0.00	23.57	64.37	4497.53	22.24	565.45	587.69	523.31
15	0.00	40.80	0.00	11.35	52.15	4469.29	22.10	561.90	583.99	531.84
16	0.00	40.80	140.00	1.63	182.44	4440.18	21.95	558.24	580.19	397.75
17	0.00	40.80	0.00	0.00	40.80	4414.54	21.83	555.02	576.84	536.04
18	0.00	40.80	0.00	0.00	40.80	4392.38	21.72	552.23	573.94	533.14

[14] TraceVerified (2025): Báo cáo "Nhìn lại thị trường tín chỉ carbon năm 2024 và dự báo xu hướng 2025" phân tích rằng giá tín chỉ từ các dự án năng lượng tái tạo dao động 5–10 USD/tấn CO_2e. Link: https://traceverified.com/nhin-lai-thi-truong-tin-chi-carbon-nam-2024-va-du-bao-xu-huong-2025/

Ecosystem Marketplace - State of the Voluntary Carbon Markets 2024: On the Path to Maturity (xuất bản 2024, dữ liệu 2023): Giá trung bình 6.53 USD/tấn CO_2e cho năng lượng tái tạo. Link: https://3298623.fs1.hubspotusercontent-na1.net/hubfs/3298623/SOVCM%202024/State_of_the_Voluntary_Carbon_Markets_20240529%201.pdf

Ecosystem Marketplace - State of the Voluntary Carbon Markets 2025: Meeting the Moment (xuất bản 2025, dữ liệu 2024): Giá dao động 5–7 USD/tấn CO_2e (giảm 5.5% so với 2023). Báo cáo dự báo tăng lên 7–9 USD/tấn nếu CCP được áp dụng. Link: https://3298623.fs1.hubspotusercontent-na1.net/hubfs/3298623/SOVCM%202025/Ecosystem%20Marketplace%20State%20of%20the%20Voluntary%20Carbon%20Market%202025.pdf

	EXPENSE (COST)					BENEFIT				
Year	Investment (million USD)	O&M (mil.USD)	Replacement and dismantling costs (mil.USD)	Foreign currency interest and fees (mil.USD)	Total C (mil.USD)	Etm (mil.kWh)	Revenue from selling CO2 credits (mil.USD)	Revenue (mil.USD)	Total B1 (mil.USD)	B - C
19	0.00	40.80	0.00	0.00	40.80	4371.96	21.61	549.66	571.28	530.47
20	0.00	40.80	0.00	0.00	40.80	4352.84	21.52	547.26	568.78	527.98
21	0.00	40.80	0.00	0.00	40.80	4334.15	21.43	544.91	566.34	525.53
22	0.00	40.80	0.00	0.00	40.80	4318.51	21.35	542.94	564.29	523.49
23	0.00	40.80	0.00	0.00	40.80	4305.04	21.28	541.25	562.53	521.73
24	0.00	40.80	0.00	0.00	40.80	4290.27	21.21	539.39	560.60	519.80
25	0.00	40.80	145.90	0.00	186.71	3419.00	16.90	429.85	446.76	260.05
26	0.00	40.80	1435.00	0.00	1475.80	3404.41	16.83	428.02	444.85	-1030.96
27	0.00	40.80	249.05	0.00	289.86	3715.52	18.37	467.13	485.50	195.64
28	0.00	40.80	0.00	0.00	40.80	4630.93	22.90	582.22	605.12	564.31
29	0.00	40.80	0.00	0.00	40.80	4615.29	22.82	580.25	603.07	562.27
30	0.00	40.80	0.00	0.00	40.80	4597.91	22.73	578.07	600.80	560.00
31	0.00	40.80	0.00	0.00	40.80	4577.48	22.63	575.50	598.13	557.33
32	0.00	40.80	0.00	0.00	40.80	4554.02	22.52	572.55	595.07	554.26
33	0.00	40.80	0.00	0.00	40.80	4526.21	22.38	569.05	591.43	550.63
34	0.00	40.80	0.00	0.00	40.80	4497.53	22.24	565.45	587.69	546.88
35	0.00	40.80	0.00	0.00	40.80	4469.29	22.10	561.90	583.99	543.19
36	0.00	40.80	0.00	0.00	40.80	4440.18	21.95	558.24	580.19	539.39
37	0.00	40.80	140.00	0.00	180.80	4414.54	21.83	555.02	576.84	396.04
38	0.00	40.80	0.00	0.00	40.80	4392.38	21.72	552.23	573.94	533.14
39	0.00	40.80	0.00	0.00	40.80	4371.96	21.61	549.66	571.28	530.47
40	0.00	40.80	0.00	0.00	40.80	4352.84	21.52	547.26	568.78	527.98
41	0.00	40.80	0.00	0.00	40.80	4334.15	21.43	544.91	566.34	525.53
42	0.00	40.80	0.00	0.00	40.80	4318.51	21.35	542.94	564.29	523.49
43	0.00	40.80	0.00	0.00	40.80	4305.04	21.28	541.25	562.53	521.73
44	0.00	40.80	0.00	0.00	40.80	4290.27	21.21	539.39	560.60	519.80
45	0.00	40.80	0.00	0.00	40.80	4273.76	21.13	537.32	558.44	517.64
46	0.00	40.80	0.00	0.00	40.80	4255.51	21.04	535.02	556.06	515.26
			0.00	0.00						

Financial analysis

Option 1: 20% equity, 80% commercial loan with 10% interest rates

(mil.USD)	Interest rate	Repayment period	Drawdown period	Total	-6,0	-5,0	-4,0	-3,0	-2,0	-1,0
Commercial loans	10%	10,0	5,0	3465,0		320,9	856,2	927,1	1214,3	146,4
Equity				292,1	17,2	35,3	94,0	103,8	41,9	
Investment capital (excluding VAT)				3757,1	17,2	356,2	950,3	1030,9	1256,2	146,4
Construction loan interest				865,3		16,0	74,9	164,1	271,1	339,2

	Year	Total	-6,0	-5,0	-4,0	-3,0	-2,0	-1,0	1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0
(1).	**Cash flow (mil.USD)**	**19718,3**				**192,6**	**383,4**	**572,4**	**492,6**	**491,2**	**489,5**	**487,7**	**485,5**	**483,0**	**480,0**	**477,0**	**474,0**	**470,9**	**468,2**	**465,9**	**463,7**	**461,7**	**459,7**	**458,0**	**456,6**
	Electricity sales revenue	**19718,3**				192,6	383,4	572,4	492,6	491,2	489,5	487,7	485,5	483,0	480,0	477,0	474,0	470,9	468,2	465,9	463,7	461,7	459,7	458,0	456,6
(2).	**Cash flow of expenses (mil.**	**12017,8**	**17,2**	**51,3**	**168,9**	**279,7**	**336,8**	**374,8**	**730,3**	**695,6**	**661,0**	**626,3**	**591,7**	**557,0**	**523,3**	**490,2**	**597,1**	**424,0**	**59,5**	**59,3**	**72,2**	**71,8**	**71,4**	**92,5**	**92,2**
	OM cost	*1703,4*				11,9	23,8	35,7	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8
	Principal repayment	*3465,0*							346,5	346,5	346,5	346,5	346,5	346,5	346,5	346,5	346,5	346,5							
	Interest + loan fees	*2684,5*		16,0	74,9	164,1	271,1	339,2	337,8	303,2	268,5	233,9	199,2	164,6	129,9	95,3	60,6	26,0							
	Resource tax	*205,6*							5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
	Corporate Income Tax	*1557,3*													0,9	2,5	4,0	5,6	13,6	13,3	26,2	25,8	25,4	46,5	46,2
	Dismantling costs	*145,9*																							
	Equity	*2256,2*	17,2	35,3	94,0	103,8	41,9										140,0								
(4).	**Revenue from CDM**							**26,7**	**23,0**	**22,9**	**22,8**	**22,7**	**22,6**	**22,5**	**22,4**	**22,2**	**22,1**	**22,0**	**21,8**	**21,7**	**21,6**	**21,5**	**21,4**	**21,4**	**21,3**
Investor cash flow		**419,7**	**-17,2**	**-51,3**	**-168,9**	**-87,1**	**46,6**	**224,2**	**-214,7**	**-181,6**	**-148,7**	**-115,9**	**-83,6**	**-51,5**	**-20,8**	**9,1**	**-101,0**	**68,8**	**430,5**	**428,3**	**413,1**	**411,4**	**409,7**	**386,9**	**385,7**

	Year	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0	26,0	27,0	28,0	29,0	30,0	31,0	32,0	33,0	34,0	35,0	36,0	37,0	38,0	39,0	40,0
(1).	**Cash flow (mil.USD)**	**455,0**	**362,6**	**361,1**	**394,1**	**491,2**	**489,5**	**487,7**	**485,5**	**483,0**	**480,0**	**477,0**	**474,0**	**470,9**	**468,2**	**465,9**	**463,7**	**461,7**	**459,7**	**458,0**	**456,6**	**455,0**	**453,3**	**451,3**
	Electricity sales revenue	455,0	362,6	361,1	394,1	491,2	489,5	487,7	485,5	483,0	480,0	477,0	474,0	470,9	468,2	465,9	463,7	461,7	459,7	458,0	456,6	455,0	453,3	451,3
(2).	**Cash flow of expenses (mil.USD)**	**91,9**	**1654,3**	**322,1**	**87,8**	**107,3**	**106,9**	**106,6**	**106,1**	**105,6**	**105,0**	**104,4**	**103,8**	**243,2**	**106,0**	**105,5**	**105,1**	**104,7**	**104,3**	**121,2**	**120,9**	**120,6**	**120,3**	**119,9**
	OM cost	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8
	Principal repayment																							
	Interest + loan fees																							
	Resource tax	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
	Corporate Income Tax	45,9	27,4	27,1	41,9	61,3	61,0	60,6	60,2	59,7	59,1	58,5	57,9	57,3	60,1	59,6	59,1	58,7	58,3	75,3	75,0	74,7	74,3	73,9
	Dismantling costs		145,9																					
	Equity		1435,0	249,1										140,0										
(4).	**Revenue from CDM**	**21,2**	**16,9**	**16,8**																				
Investor cash flow		**384,4**	**-1274,8**	**55,8**	**306,2**	**383,9**	**382,6**	**381,1**	**379,4**	**377,4**	**375,0**	**372,6**	**370,2**	**227,7**	**362,2**	**360,3**	**358,6**	**357,0**	**355,4**	**336,8**	**335,7**	**334,4**	**333,0**	**331,4**

Net Present Value	mil.USD	**419,7**
Internal Rate of Return	%	**12,0**
BENEFIT/COST	-	**1,1**
Pay Back Period	year	**15,0**
BREAK EVEN POINT	cents/kW	**9,4**

Option 2: 20% equity, USD loan to purchase equipment with 7% interest rate, the rest is commercial loan with 10% interest rate

(mil.USD)	Interest rate	Repayment period	Drawdown period	Total	-6,0	-5,0	-4,0	-3,0	-2,0	-1,0
Commercial - PV + BESS	10,00%	10,0	4,0	1161,9		174,0	333,0	347,5	307,5	
Borrow foreign currency to buy PV+BESS equipment	7,00%	10,0	4,0	1435,0		71,8	358,8	430,5	574,0	
Commercial Loan - PSH	10,00%	10,0	5,0	411,7		40,1	82,3	87,6	148,7	53,0
Borrow foreign currency to buy PSH equipment	7,00%	10,0	3,0	311,3				62,3	155,7	93,4
Line loan	10,00%			115,9		34,8	81,1			
Equity				321,2	17,2	35,6	95,0	103,1	70,3	
InvesCommercialent capital (excluding VAT)				3757,1	17,2	356,2	950,3	1030,9	1256,2	146,4
Construction loan interest				536,2	0,0	26,5	70,7	148,6	233,0	57,4

	Year	Total	-6,0	-5,0	-4,0	-3,0	-2,0	-1,0	1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0
(1).	**Cash flow (tr.USD)**	**18707,7**				**182,7**	**363,8**	**543,0**	**467,3**	**466,0**	**464,4**	**462,7**	**460,6**	**458,2**	**455,4**	**452,6**	**449,7**	**446,8**	**444,2**	**442,0**	**439,9**	**438,0**	**436,1**	**434,5**	**433,2**
	Electricity sales revenue	**18707,7**				182,7	363,8	543,0	467,3	466,0	464,4	462,7	460,6	458,2	455,4	452,6	449,7	446,8	444,2	442,0	439,9	438,0	436,1	434,5	433,2
(2).	**Cash flow of expenses (tr.USD)**	**11276,1**	**17,2**	**50,6**	**162,3**	**258,6**	**325,1**	**586,5**	**650,6**	**621,5**	**592,4**	**563,3**	**534,1**	**506,4**	**478,6**	**450,7**	**562,9**	**129,3**	**58,8**	**58,5**	**70,7**	**70,3**	**70,0**	**91,1**	**90,8**
	OM cost	*1703,4*				11,9	23,8	35,7	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8
	Principal repayment	*3435,9*						271,3	343,6	343,6	343,6	343,6	343,6	343,6	343,6	343,6	343,6	72,3							
	Interest + loan fees	*2042,7*		15,0	67,3	143,7	231,0	279,6	261,1	232,0	202,9	173,7	144,6	115,5	86,4	57,3	28,1	4,7							
	Resource tax	*205,6*							5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
	Corporate Income Tax	*1457,4*												1,3	2,7	4,0	5,3	6,3	12,8	12,6	24,8	24,4	24,0	45,1	44,8
	Dismantling costs	*145,9*																							
	Equity	*2285,3*	17,2	35,6	95,0	103,1	70,3										140,0								
(4).	**Revenue from CDM**							**26,7**	**23,0**	**22,9**	**22,8**	**22,7**	**22,6**	**22,5**	**22,4**	**22,2**	**22,1**	**22,0**	**21,8**	**21,7**	**21,6**	**21,5**	**21,4**	**21,4**	**21,3**
Investor cash flow		**662,6**	**-17,2**	**-50,6**	**-162,3**	**-75,9**	**38,6**	**-16,8**	**-160,3**	**-132,6**	**-105,2**	**-77,9**	**-50,9**	**-25,6**	**-0,7**	**24,0**	**-91,1**	**339,5**	**407,3**	**405,2**	**390,8**	**389,2**	**387,6**	**364,8**	**363,7**

	Year	18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0	26,0	27,0	28,0	29,0	30,0	31,0	32,0	33,0	34,0	35,0	36,0	37,0	38,0	39,0	40,0
(1).	**Cash flow (tr.USD)**	**431,7**	**344,0**	**342,6**	**373,9**	**466,0**	**464,4**	**462,7**	**460,6**	**458,2**	**455,4**	**452,6**	**449,7**	**446,8**	**444,2**	**442,0**	**439,9**	**438,0**	**436,1**	**434,5**	**433,2**	**431,7**	**430,0**	**428,2**
	Electricity sales revenue	431,7	344,0	342,6	373,9	466,0	464,4	462,7	460,6	458,2	455,4	452,6	449,7	446,8	444,2	442,0	439,9	438,0	436,1	434,5	433,2	431,7	430,0	428,2
(2).	**Cash flow of expenses (tr.USD)**	**90,5**	**1653,9**	**321,7**	**83,8**	**102,2**	**101,9**	**101,6**	**101,2**	**100,7**	**100,1**	**99,5**	**99,0**	**238,4**	**101,2**	**100,7**	**100,3**	**100,0**	**99,6**	**116,5**	**116,3**	**116,0**	**115,6**	**115,3**
	OM cost	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8
	Principal repayment																							
	Interest + loan fees																							
	Resource tax	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
	Corporate Income Tax	44,5	27,0	26,7	37,9	56,3	56,0	55,6	55,2	54,7	54,2	53,6	53,0	52,4	55,3	54,8	54,4	54,0	53,6	70,6	70,3	70,0	69,7	69,3
	Dismantling costs		145,9																					
	Equity		1435,0	249,1										140,0										
(4).	**Revenue from CDM**	**21,2**	**16,9**	**16,8**																				
Investor cash flow		**362,4**	**-1292,9**	**37,7**	**290,1**	**363,8**	**362,5**	**361,1**	**359,4**	**357,6**	**355,3**	**353,0**	**350,7**	**208,4**	**343,0**	**341,2**	**339,6**	**338,0**	**336,5**	**318,0**	**316,9**	**315,7**	**314,4**	**312,9**

Net Present Value	tr.USD	**662,6**
Internal Rate of Return	%	**12,0**
BENEFIT/COST	-	**1,2**
Pay Back Period	year	**14,0**
BREAK-EVEN POINT	cents/kW	**8,5**

Option 3: 20% equity, EUR loan to purchase equipment with interest rate of 4.46%, the rest is commercial loan with interest rate of 10%

(mil.USD)	Interest rate	Repayment period	Drawdown period	Total	-6,0	-5,0	-4,0	-3,0	-2,0	-1,0
Commercial - PV + BESS	10,00%	10,0	4,0	1106,2		174,0	333,0	347,5	251,8	
Borrow foreign currency to buy PV+BESS equipment	4,46%	10,0	4,0	1435,0		71,8	358,8	430,5	574,0	
Commercial Loan - PSH	10,00%	10,0	5,0	411,7		40,1	82,3	87,6	148,7	53,0
Borrow foreign currency to buy PSH equipment	4,46%	10,0	3,0	311,3				62,3	155,7	93,4
Line loan	10,00%			115,9		34,8	81,1			
Equity				377,0	17,2	35,6	95,0	103,1	126,1	
Investment capital (excluding VAT)				3757,1	17,2	356,2	950,3	1030,9	1256,2	146,4
Construction loan interest				465,2		23,1	63,5	130,5	197,4	50,6

	Year	Total	-6,0	-5,0	-4,0	-3,0	-2,0	-1,0	1,0	2,0	3,0	4,0	5,0	6,0	7,0	8,0	9,0	10,0	11,0	12,0	13,0	14,0	15,0	16,0	17,0
(1).	**Cash flow (tr.USD)**	**17742,8**				**173,3**	**345,0**	**515,0**	**443,2**	**441,9**	**440,5**	**438,8**	**436,8**	**434,6**	**432,0**	**429,2**	**426,5**	**423,7**	**421,3**	**419,2**	**417,2**	**415,4**	**413,6**	**412,1**	**410,8**
	Electricity sales revenue	**17742,8**				173,3	345,0	515,0	443,2	441,9	440,5	438,8	436,8	434,6	432,0	429,2	426,5	423,7	421,3	419,2	417,2	415,4	413,6	412,1	410,8
(2).	**Cash flow of expenses (tr.USD)**	**10821,5**	**17,2**	**49,7**	**155,9**	**241,4**	**345,3**	**533,3**	**600,6**	**576,4**	**552,3**	**528,2**	**504,3**	**481,2**	**458,2**	**435,1**	**552,1**	**127,7**	**56,8**	**56,6**	**66,9**	**66,5**	**66,2**	**87,3**	**87,0**
	OM cost	*1703,4*				11,9	23,8	35,7	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8
	Principal repayment	*3380,1*						265,7	338,0	338,0	338,0	338,0	338,0	338,0	338,0	338,0	338,0	72,3							
	Interest + loan fees	*1713,9*		14,0	60,9	126,5	195,5	231,9	216,6	192,5	168,4	144,2	120,1	96,0	71,9	47,7	23,6	4,1							
	Resource tax	*205,6*							5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
	Corporate Income Tax	*1331,6*											0,2	1,3	2,4	3,5	4,5	5,4	10,9	10,7	20,9	20,6	20,2	41,3	41,1
	Dismantling costs	*145,9*																							
	Equity	*2341,0*	17,2	35,6	95,0	103,1	126,1										140,0								
(4).	**Revenue from CDM**							**26,7**	**23,0**	**22,9**	**22,8**	**22,7**	**22,6**	**22,5**	**22,4**	**22,2**	**22,1**	**22,0**	**21,8**	**21,7**	**21,6**	**21,5**	**21,4**	**21,4**	**21,3**
Investor cash flow		**877,2**	**-17,2**	**-49,7**	**-155,9**	**-68,1**	**-0,4**	**8,4**	**-134,4**	**-111,6**	**-89,0**	**-66,7**	**-44,8**	**-24,1**	**-3,9**	**16,3**	**-103,5**	**318,0**	**386,3**	**384,3**	**372,0**	**370,4**	**368,9**	**346,2**	**345,1**

	Year		18,0	19,0	20,0	21,0	22,0	23,0	24,0	25,0	26,0	27,0	28,0	29,0	30,0	31,0	32,0	33,0	34,0	35,0	36,0	37,0	38,0	39,0	40,0
(1).	**Cash flow (tr.USD)**		**409,4**	**326,3**	**324,9**	**354,6**	**441,9**	**440,5**	**438,8**	**436,8**	**434,6**	**432,0**	**429,2**	**426,5**	**423,7**	**421,3**	**419,2**	**417,2**	**415,4**	**413,6**	**412,1**	**410,8**	**409,4**	**407,9**	**406,1**
	Electricity sales revenue		409,4	326,3	324,9	354,6	441,9	440,5	438,8	436,8	434,6	432,0	429,2	426,5	423,7	421,3	419,2	417,2	415,4	413,6	412,1	410,8	409,4	407,9	406,1
(2).	**Cash flow of expenses (tr.USD)**		**86,7**	**1651,0**	**318,9**	**80,0**	**97,4**	**97,1**	**96,8**	**96,4**	**96,0**	**95,4**	**94,9**	**94,3**	**233,8**	**96,6**	**96,2**	**95,8**	**95,4**	**95,1**	**112,0**	**111,8**	**111,5**	**111,2**	**110,8**
	OM cost		40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8	40,8
	Principal repayment																								
	Interest + loan fees																								
	Resource tax		5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1	5,1
	Corporate Income Tax		40,8	24,2	23,9	34,0	51,5	51,2	50,9	50,5	50,0	49,5	48,9	48,4	47,8	50,7	50,2	49,9	49,5	49,1	66,1	65,8	65,6	65,3	64,9
	Dismantling costs			145,9																					
	Equity			1435,0	249,1										140,0										
(4).	**Revenue from CDM**		**21,2**	**16,9**	**16,8**																				
Investor cash flow			**343,9**	**-1307,8**	**22,8**	**274,6**	**344,5**	**343,3**	**342,0**	**340,4**	**338,7**	**336,5**	**334,3**	**332,2**	**190,0**	**324,7**	**323,0**	**321,4**	**320,0**	**318,5**	**300,1**	**299,1**	**297,9**	**296,7**	**295,3**

Net Present Value	tr.USD	**877,2**
Internal Rate of Return	%	**12,0**
BENEFIT/COST	-	**1,2**
Pay Back Period	year	**13,0**
BREAK-EVEN POINT	cents/kW	**7,7**