

Initial Environmental Examination

April, 2019

Vietnam, Hong Phong 1 Energy Joint Stock Company

Prepared by Hong Phong 1 Energy Joint Stock Company for Credit Guarantee and Investment Facility, a trust fund of the Asian Development Bank. This is an unofficial English version available at <http://www.cgif-abmi.org/index.php/category/safeguards/safeguards-documents/>

This initial environmental examination is a document of the borrower. The views expressed herein are those of the borrower and may be preliminary in nature.

LIST OF WORKS AND ABBREVIATIONS

ATLĐ	: Labor safety
BOD ₅	: Demand for bio-oxygen at 20oC for 5 days
BCT	: Ministry of Industry and Trade
BLĐTBXH	: Ministry of Labor, Invalids and Social Affairs
BTC	: The financial
BTCT	: Reinforced concrete
BTNMT	: Ministry of Natural Resources and Environment
BVMT	Environmental Protection
BYT	Ministry of Health
COD	: Demand for chemical oxygen
CHXHCN	: Socialist Republic
CP	: Government
CTNH	: Hazardous waste
CTR	: Solid waste
DO	: Dissolved oxygen concentration
ĐTM	Environmental Impact Assessment
EVN	: Vietnam Electricity Corporation
EVN SPC	Southern Power Corporation
IEC	: International Electrotechnical Commission
kV	: kilovolts
MBA	: Transformers
NĐ	: Decree
ĐDDN	: Line connection
ĐMT	: Solar power plant
NMĐ	: Electric Factory
K/L	: Weigh
PCCC	: Fire protection
QCVN	: Vietnamese standards
QĐ	: Decision
QLDA	: Project management

QLMT	: Environmental Management
Sở TN&MT	: Resource base and environment
SGTVT	: Transportation facilities
SS	: Floating solids
TBA	: Substation
TCVN	: Vietnam standard
THC	: Total Hydrogen
TNMT	: Natural Resources and Environment
UBMTTQ	: Fatherland Front Committees
UBND	: People's Committee
WHO	: World Health Organization

PREAMBLE

1. THE ORIGIN OF THE PROJECT

1.1. Summary of origin, introduction of the project

Earth reserves such as coal and gas, river flows and waterfalls, uranium and thorium mines are being exploited to generate electricity, hydropower and nuclear power will come to exhaustion. In addition, with the circumstances of high cost, unstable supply, the alternative energy sources become the scientists' concern. Along with the wind, sunlight is a natural resource, a source of light or energy emitted by the near-infinite sun as well as the infinity of the sun itself.

Every year, the sun supplies the Earth with enormous amounts of energy and the economic efficiency of solar power surpasses other types of energy. Not only that, solar power has many advantages over other types of power plants such as clean, safe, not pollute the environment as traditional thermal power plant, there is no risk of catastrophe such as breaking hydroelectric dams or nuclear power plant explosion.

The Earth, even if it receives only a tiny fraction of the total solar energy, such small part to the total human needs is very important. Vietnam is a hot tropical climate almost year-round, especially in the southern provinces of Central Vietnam with high radiation intensity, in which Binh Thuan is a province in the monsoon tropical sub-equatorial climate, sunny, windy, so it is very suitable for solar power projects.

Solar power is a field of research and application that transforms direct sunlight into electricity using solar cells. Today, because of the growing demand for clean energy, the solar cell industry is growing rapidly. Access to use these new sources of energy not only contributes to the energy supply of society but also helps to save energy and reduce environmental pollution.

To promote the use of solar energy from nature in which Binh Thuan province has many advantages, as well as meeting the growth rate in the coming years and avoiding the shortage of electricity in the dry season, the Power Engineering

Consulting Joint Stock Company 2 (under the Vietnam Electricity Group) has formulated the project "Planning for development of solar power in Binh Thuan province up to 2020 with a vision to 2030" according to the policy of the province. According to the assessment, the potential solar power in Binh Thuan is very large, can reach the total design capacity up to 4,754.5 MW. And the People's Committee of Binh Thuan province has approved the Vietnam Trading Engineering Construction Joint Stock Corporation to survey, research and construct the Hong Phong 1 Solar Power Plant with two projects *Hong Phong 1A and Hong Phong 1A solar power plants* with a total capacity of 250MW, on the project land area of 350ha, according to Document No. 61/UBND-KT dated 06/01/2017.

In particular, Hong Phong 1Energy Joint Stock Company is the Investor of the project "Hong Phong 1A Solar Power Plant, capacity of 150MW." And the company has been approved by People's Committee of Binh Thuan province to invest in the project in accordance with investment decision (principle) No. 1037/QĐ-UBND dated April 17, 2017.

This is a new construction project, the investment in the construction of solar power plants in the current period is absolutely urgent for the sustainable development of Vietnam's electricity power in general and meet the demand for additional load in The coming years of Binh Thuan province as well as neighboring provinces in particular.

Pursuant to the Government's Decree No. 18/2015/ND-CP dated 14/02/2015 on environmental protection planning, strategic environmental assessment, environmental impact assessment and environmental protection planning. - Annex II, ordinal number 27 (building a factory with an area of over 100 ha), the project is required to make an environmental impact assessment report. Therefore, Hong Phong 1Energy Joint Stock Company has cooperated with the consultant company is Nong Lam Environmental Technology Company Limite to make an environmental impact assessment report for the project "Hong Phong 1A

Solar Power Plant, capacity of 150MW".

1.2. Agency and organization competent to approve investment project

Investment project "Hong Phong 1A solar power project, 150MW capacity" and approved by Hong Phong 1 energy joint stock company.

1.3. The relationship between the this project and development plannings shall be evaluated and approved by the competent state management agencies.

Investment project "Hong Phong 1A solar power project, 150MW capacity" and approved by Hong Phong 1 energy joint stock company belonging to the Hong Phong 1 solar power project Group and the People's Committee of Binh Thuan province approved by Documentary No. 61/UBND-KT dated 06 January 2017.

The investment in plant construction is according to:

Binh Thuan province's solar power development planning phase to 2020 with a vision to 2030;

- Decision No.2068/QĐ-TTg, dated 25/11/2015 of Prime Minister approving Renewable energy development planning of Viet Nam up to 2030 with a vision to 2050;

- Decision No. 428/QĐ-TTg dated 18/3/2016 of Prime Minister approving the adjustment of the National Power Development Planning phase 2011-2020 with a vision to 2030 ;

- Decision No. 11/2017/QĐ-TTg dated 11/4/2017 of Prime Minister to approved on development incentive mechanism of solar power projects in Viet Nam. Whereby, the total capacity of solar power from a negligible level as now will to about 850MW on 2020, about 4,000MW on 2025 and about 12,000MW on 2030, the electricity produced from solar power accounts for billions Approximately 0.5% on 2020, about 1.6% on 2025 and about 3.3% on 2030.

Thus, the construction of "Hong Phong 1A solar power plant with the capacity of 150MW" in the present period is perfectly suited to the demand of Binh Thuan province in particular and the whole country in general.

2. THE LAW AND TECHNIQUES OF IMPLEMENTING THE EIA

2.1. The legal documents, Yardstick, standards and technical guidelines

The legal documents

- Environmental Protection law No 55/2014/QH13 was adopted by the National assembly of the Socialist Republic of Vietnam, Session XIII, 7th meeting on dated 23/6/ 2014, had effective from 01/01/2015.

- Law on Water Resources No. 17/2012 / QH13 was adopted by the National Assembly of the Socialist Republic of Vietnam, Session XIII, 3rd meeting on dated 21/6/ 2012, had effective from 01/01/2013.

- The Electricity Law No. 28/2004 / QH11 was adopted by the National Assembly of the Socialist Republic of Vietnam, Session XI, 6 th meeting on dated 3rd December, 2004, had effective from 1st July , 2005

- Law No. 24/2012/QH13 dated 20/11/2012:of the National Assembly of the Socialist Republic of Vietnam on amending and supplementing some articles of Electricity Law No. 28/2004/QH11 dated 01/07/2013.

- Land Law No. 45/2013 / QH13 was adopted by the National Assembly of the Socialist Republic of Vietnam, Session XIII, 6th meeting on dated 29/11/2013, had effective from 01/07/2014.

- Construction Law No. 50/2014 / QH13 was adopted by the National Assembly of the Socialist Republic of Vietnam, Session XIII, 7th meeting on dated 18/6/2014, had effective from 01/01/2015.

- Law on fire prevention and fighting 27/2001 / QH10 was adopted by the National Assembly of the Socialist Republic of Vietnam, Session X, 9th meeting on dated 29/6/2001, had effective from 4/10/2001.

- Law No. 40/2013 / QH13 dated 22/11/2013 of the National Assembly on amending and supplementing some articles of the Law on fire prevention and fighting No. 27/2001 / QH10, effective from July 1, 2014.

- The Investment Law No. 67/2014 / QH13 was adopted by the National Assembly of the Socialist Republic of Vietnam Session X, 9th meeting on dated 26/11/2014, had effective from 01/07/2015.

- Decree No. 11/2010 / ND-CP dated 24/02/2010 of the Ministry of Construction on the protection of road infrastructure.

- Decree No. 35/2003 / ND-CP dated 04/4/2003 of the Government detailing a number of articles of the Law on Fire Prevention and Fighting
- Decree No. 108/2006 / ND-CP dated 22/9/2006 of the Government detailing and guiding the implementation of some articles of the Investment Law.
- Decree No. 59/2007 / ND-CP dated 09/4/2007 of the Government on solid waste management.
- Decree No. 134/2013 / ND-CP dated 17/10/2013 of the Government stipulating sanctions administrative violations in the field of electricity, hydropower dam safety, economical and efficient use of energy.
- Decree No. 14/2014 / ND-CP dated 26/02/2014 of the Government detailing the implementation of the electricity law on electric safety.
- Decree No. 43/2014 / ND-CP dated 15/5/2014 of the Government detailing the implementation of a number of articles of the Land Law.
- Decree No. 47/2014 / ND-CP dated 15/5/2014 by the Government on compensation, support and resettlement when land recovered by Government.
- Decree No. 46/2015 / ND-CP dated 12/05/2015 of the Government on quality control and maintenance of construction works.
- Decree No. 201/2013 / ND-CP dated 27/11/2013 of the Government on detailing the implementation of a number of articles of the Law on Water Resources.
- Decree No. 79/2014 / ND-CP dated 31/7/2014 of the Government on detailing the implementation of a number of articles of the Law on Fire Prevention and Fighting and the Law Amending and Supplementing a Number of Articles of the Law on Fire Prevention and Fighting.
- Decree 80/2014 / ND-CP dated 06/8/2014 on water drainage and waste water treatment. - Decree No. 18/2015 / ND-CP dated 14/02/2015 of the Government on regulations on environmental protection planning, strategic environmental assessment, environmental impact assessment and plan environmental Protection.
- Decree No. 32/2015 / ND-CP dated 25/03/2015 of the Government on management of construction investment costs.
- Decree 38/2015/ND-CP dated 24/04/2015 of the Government on waste and waste management.

- Decree No. 46/2015 / ND-CP dated 12/05/2015 of the Government on quality control and maintenance of construction works.

- Decree No. 59/2015/NĐ-CP dated 18 June 2015 of Government regulating detail some of the contents of implementing the Construction Law 2014 on the management of construction investment projects;

- Decree No. 154/2016 / ND-CP dated 16/11/2016 of the Government on environmental protection charges for wastewater.

- Decree No. 155/2016/ND-CP dated 18/11/2016 of the Government on providing for the sanctioning of administrative violations in the field of environmental protection.

- Decree No. 42/2017 / ND-CP dated 05/04/2017 of the Government on amending and supplementing some articles of Decree No. 59/2015/ND-CP dated 18/06/2015 on management of construction investment.

- Circular No. 13/2007/TT-BXD dated 31/12/2007 of the Ministry of Construction guiding some articles of the Government's Decree No. 59/2007 / ND-CP dated 09/4/2007 on management of Solid waste.

- Circular No. 22/201/TT-BXD dated 03/12/2010 of the Ministry of Construction on regulation on labor safety in construction work.

- Circular No. 31/2014/TT-BCT dated 2/10/2014 of the Ministry of Industry and Trade regulating some details on electrical safety.

- Circular No. 36/2015/TT-BTNMT dated 30/06/2015 of the Ministry of Natural Resources and Environment on regulations on management of hazardous waste.

- Decision No. 3733/2002/QĐ-BYT dated 10/10/2002 of the Ministry of Health promulgating 21 labor sanitation standards, 05 principles and 07 labor sanitation parameters.

- Decision No. 06/2006/QĐ-BXD dated 17/3/2006 of the Ministry of Construction promulgating TCXDVN 33: 2006 "Water supply - pipeline network and project.- design standards".

- Decision No. 04/2008 / QĐ-BXD dated 03/04/2008 of the Ministry of Construction promulgating the national technical regulations on construction planning (QCXDVN 01: 2008/BXD).

- Decision No. 05/2015/QD-UBND dated 13/02/2015 of the People's Committee of Binh Thuan province on Regulations and the price of compensation for property damage when the State recovers land for construction of works in Binh Thuan province.

- Decision No. 08/2015/QD-UBND dated 02/03/2015 of the People's Committee of Binh Thuan province on compensation, support and resettlement when the State recovers land.

Applicable standards

Climate

- QCVN 26:2016/BYT - National Technical Regulation on climate - Value allow microclimate at working.

- QCVN 05: 2013/BTNMT: National technical regulation on ambient air quality.

- Decision No. 3733/2002/QD-BYT: Promulgating 21 labor sanitation standards, 5 principles and 7 sanitation parameters.

- QCVN 06: 2009 / BTNMT: National technical regulation on some hazardous substances in ambient air.

- QCVN 19: 2009 / BTNMT: National technical regulation on industrial emissions for dust and inorganic substances.

-QCVN04:2009/BGTVT-NationalTechnicalRegulation on motorcycle emissions, motorcycle manufacture, assembly and new import.

- QCVN 05: 2009 / BGTVT - National technical regulation on car emissions, motorcycle manufacture, assembly and new import.

Noise and vibration

-QCVN26:2010/BTNMT: National technical standards of noise.

-QCVN24:2016/BYT-National technical standards of noise - Exposure levels allow of noise in the workplace.

- QCVN 27:2010/BTNMT: National technical standards of vibration

- QCVN 27:2016/BYT - National technical standards of vibration - value allow in the workplace

Wastewater:

- QCVN 14: 2008 / BTNMT: National technical regulation on domestic wastewater.

Land

- QCVN 03-MT:2015/BTNMT: National technical regulation on limits of heavy metals in soil.

Surface and groundwater

- QCVN 08-MT: 2015 / BTNMT: National technical regulation on surface water quality.

- QCVN 09-MT: 2015 / BTNMT: National technical regulation on groundwater quality.

Solid waste

- TCVN 6705: 2009: normal solid waste - Classification.

- TCVN 6706: 2009: Hazardous waste - Classification.

- TCVN 6707: 2009: Hazardous waste - Warning signs.

- QCVN 07: 2009 / BTNMT - Hazardous waste thresholds.

Electromagnetic fields

- QCVN 25: 2016 / BYT: Electromagnetic Field Frequency Industries - Contact Levels allow electromagnetic field with frequencies in the workplace.

2.2. Legal documents of the project

- Documentary No. 61/UBND-KT of the People's Committee of Binh Thuan province dated 06 January 2017 on the establishment of a solar power factory project in Hong Phong commune, Bac Binh district;

- Decision No. 1037 / QĐ-UBND of People's Committee of Binh Thuan Province dated 17/04/2017 on approving the investor of Hong Phong 1 Energy JSC to implement the project of Hong Phong 1A solar power plant.

- Presentation No. 2236/ T-UBND dated 15/6/2017 of the People's Committee of Binh Thuan province on the submission to the Ministry of Industry and Trade for appraisal and approval of adjustment and supplement to the National Electricity Development Plan for stage 2011-2020, Taking into consideration 2030 (Supplement to the Hong Phong 1 solar power plant group).

- Business registration certificates of joint stock company enterprise code 3401145801 issued by Department of planning and investment first time dated on March 27th 2017.

2.3. The documents supplied by the project owner

- Investment project report: "Hong Phong IA solar power project, capacity of 150 MWp
- Technical drawings of the project (overall plan, traffic, drainage ...).
- investigate and survey data on environmental, living and economic factors in the project area was conducted in October 2017.
- The results of measurement and analysis of environmental samples in the project area in 10/2017.

3. ORGANIZATION TO IMPLEMENT ENVIRONMENTAL IMPACT ASSESSMENT

3.1. Organization to Implement EIA report

Investor

Name of company : Hong Phong 1 energy joint stock company

Repretentative : Mr Bui Van Hieu Position : Director

Address :Hong Trung village, Hong Phong commue, Bac Binh district Bình Thuận province.

Consultant:

Name of company : Nong Lam Environmental Technology Company Limited

Repretentative : Mr Phan Tuấn Triều Position: Chairman

Address : Zone O.51, Vạn Phúc 1 building, Hiệp Bình Phước Ward, Thủ Đức district

Telephone : (08)73008766 Fax: (08)73008755

Website : www.moitruongnonglam.com

3.2. List of members participating in the EIA report

The list of participants directly involved in the implementation of the EIA report is as follows:

No.	Full name	Academic title and distinction	Agency and duties	Experience of participants (year)	Signature
Investor - Hong Phong 1Energy Joint Stock Company					
1	Bui Van Hieu	Director	<ul style="list-style-type: none"> - The company provides project information, project support, inspection of all information provided. - To take responsibility before law for all contents of the project EIA reports. 		
Consulant – Nong Lam Environmental Technology Company Limite					
1	Phan Tuan Son	Director	<ul style="list-style-type: none"> - Check the entire report. - To be responsible to the project Investor and the Vietnamese law for the source of data and data presented and cited. 	13	
Group of environmental impact assessment report (Nong Lam Environmental Technology Company Limited)					
2	Hoang Thi Bich Thao	MA in Environment	- Field survey - environmental measurement.	8	

No.	Full name	Academic title and distinction	Agency and duties	Experience of participants (year)	Signature
			<ul style="list-style-type: none"> - Data collection and processing. - Heading. - A brief description of the project (chapter 1). 		
3	Nguyen Thi Thuy Ngan	Environmental engineer	<ul style="list-style-type: none"> - Data collection and processing. - The natural, socio-economic conditions; Consider the suitability of the project with these conditions (chapter 2). - Estimation and assessment of Impacts (Chapter 3). 	7	
4	Nguyen Thi Ngoc Yen	Environmental engineer	<ul style="list-style-type: none"> - A brief description of the project (chapter 1). - The natural, socio-economic conditions. - Estimation and assessment of Impacts (Chapter 3). - Proposed measures to reduce and mitigate impacts (chapter 4). 	10	

No.	Full name	Academic title and distinction	Agency and duties	Experience of participants (year)	Signature
			- Synthesize and complete the report.		

3. METHODS APPLIED IN THE IMPLEMENTATION OF THE EIA

The methods used in the implementation of EIA are as follows:

EIA Methodology:

Listing method:

- List the environmental impacts generated by the project activity
- List environmental impacts caused by the project operation, including environmental pollutants: waste water, emissions, solid waste, labor safety, fire, and environmental sanitation.
- Forecast of environmental, economic and social impacts in the area caused by project activities.

Rapid Appraisal: Rapid assessment of soil, water and air pollution by the Economopolus, issued by the World Health Organization (WHO) in 1993, has been used to assess the impact environment by the project.

Expert method: A method of using a team of experts with appropriate qualifications and experience to carry out environmental impact assessment.

Map overlapping method: to take a preliminary look at the impacts of the project on each of the environmental components in the area, from which the next research orientation. This method is based on the principle of comparing specialized maps (topographic maps, vegetation maps, soil maps, land use maps, surface flow maps, geological maps, geological maps, population distribution maps ...) with the same maps of the environment. Currently, GIS (Geographic

Information System) technology allows to implement this method quickly and accurately.

Other methods:

Research method, field survey:

□ Descriptive statistics through documenting and field surveys include:

+ Geography, soil

+ Hydrographic meteorology

+ Socio-economic conditions

+ Ecosystems.

□ Survey on environmental status of the project area:

+ Air quality survey

+ Land quality survey.

Comparative method:

To compare technical and economic interests, to select and propose mitigation measures for environmental, economic and social impacts of the project.

Use to assess sources of pollution on the basis of Vietnamese environmental standards and regulations.

This is a commonly used method, so high levels of reliability.

Method of inheriting and synthesizing materials: This is an indispensable method in EIA and scientific research. Inheriting previous research and reporting results is the need to develop feasible aspects, minimizing previous limitations and mistakes. Refer documents, especially related to the project, playing an important role in identifying and analyzing impacts related to the project activity.

CHAPTER 1

DESCRIPTION OF THE PROJECT SUMMARY

1.1. NAME OF PROJECT

Hong Phong 1A solar power project, 150MW Capacity

1.2. INVESTOR

- Name of investor: Hong Phong 1 energy joint stock company
- Business registration certificates of joint stock company enterprise code 3401145819 issued by Department of planning and investment first time dated on March 27th 2017.

+ Head office address: Hong Trung village, Hong Phong commue, Bac Binh district Binh Thuận province.

+ Telephone number: 0961192199

+ Legal representative of the company:

Name: Bui Van Hieu;

Position : Chairman of the Board.

1.3. GEOGRAPHICAL POSITION OF THE PROJECT

Hong Phong 1A (150MW) and Hong Phong 1B (100MW) solar power plants belonging to the Hong Phong 1 Solar Power Plant, located in Hong Phong commune, Bac Binh district, Binh Thuan province.

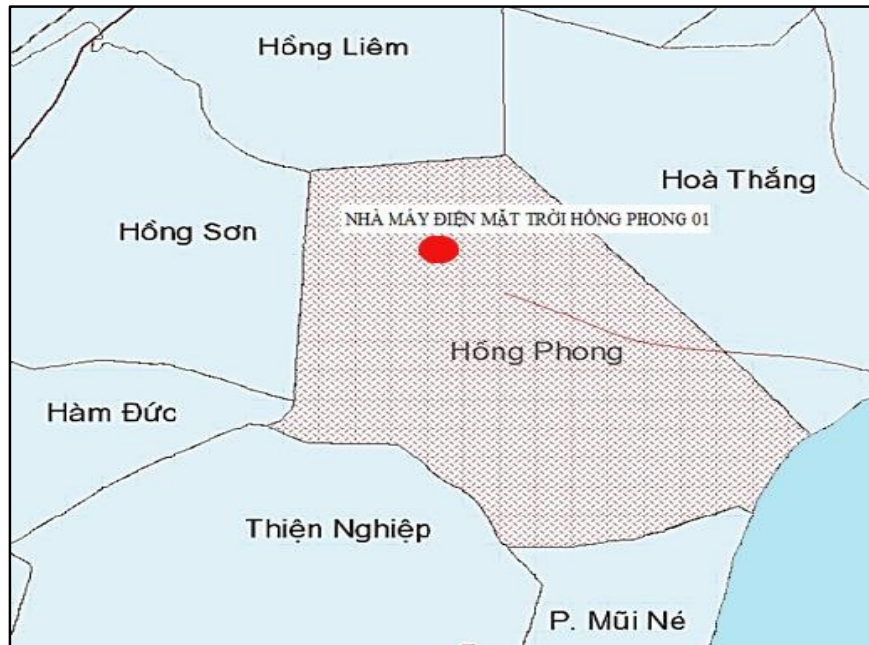


Figure 1. Location of Hong Phong 1 solar power plant cluster

Hong Phong 1 solar power plant consists of 02 plots (107 ha and 243 ha) on the same land area of 350 ha, between 2 plots with provincial road 711 (planned) passing. In particular, Hong Phong 1A solar power plant: 150 MW_p, including plot 1 and a part of plot 2 with total area is 210ha(107 ha + 103 ha).

Both Hong Phong 1A and 1B solar power plants share common area and transformer station with an area of 12.5 ha.

The boundary of the project is as follows:

Table 1. 1 The coordinates of the location of the project site (According to the VN2000 coordinates)

Number of Points	X (m)	Y (m)
Plot#1 (107 ha)		
1	1224830,000	476182,000
2	1224659,000	477810,000
3	1224044,000	477718,000
4	1224245,000	457889,000
Plot #2 (103 ha)		

Number of Points	X (m)	Y (m)
5	1223642,000	477658,000
6	1222585,000	477500,000
A	1223767,502	476698,161
B	1222756,036	476520,755
share common area and transformer station		
C	1223849,167	476073,623
D	1223650,666	476032,268
E	1223744,674	475379,779
8	1223926,000	475486,000

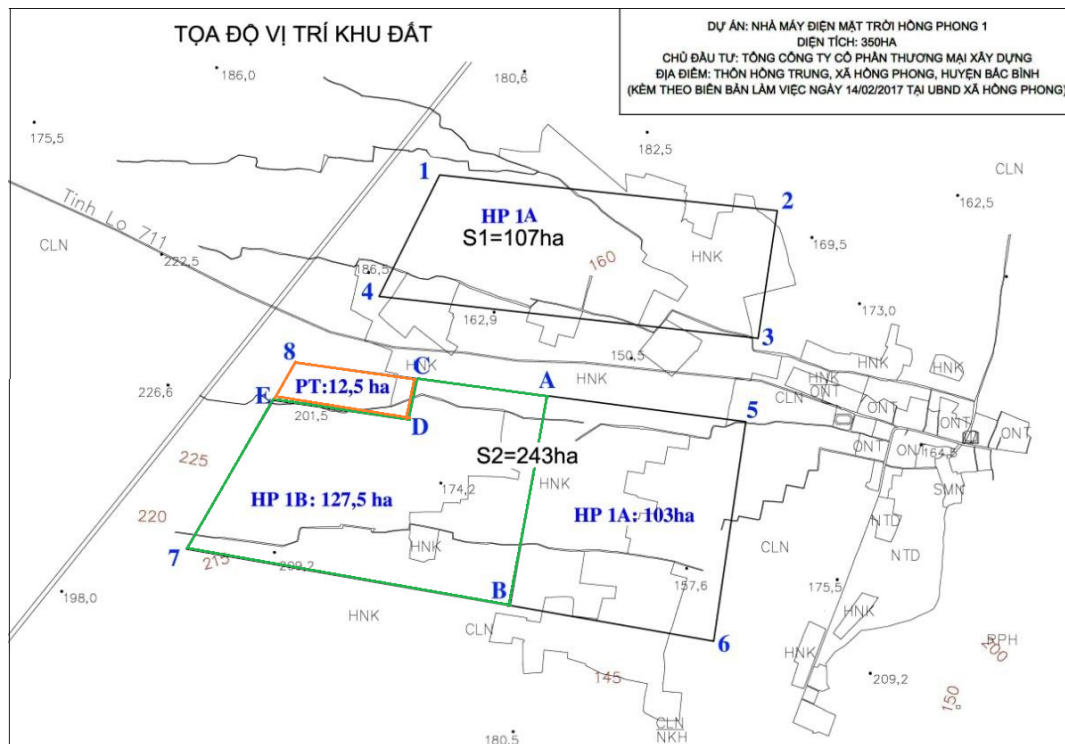


Figure 1. 2 Location coordinates of the project site

Location of the project in relation to:

Natural objects:

Road system:

- The project area is about 11 km from National Highway 1A to the Northwest, about 25 km from Phan Thiet City to the South West.

- Approximately 3.5 km to the South-east of the project is DT-715 road, this road starts from Highway 1A (Luong Son) through Hoa Thang and Hong Phong communes to Ham Thuan Bac and connects with road DT-716. The section passing through Bac Binh district is 33,186km long, the surface of asphalted concrete road, the width of the road surface is 6m, the whole road reaches the grade III road standard.

- According to the plan of the Province, provincial road 711 will pass through the project area.

River system:

- There are no rivers or streams in the project area.

- Approximately 12 km to the South east of the project is South China Sea.

Socio-economic subjects:

- There are no inhabitants in the project land.

- Outside the project: the plot # 1 is about 700m to the the nearest residential area and the plot # 2 is about 552m to the east of the nearest residential area.

- Approximately 3.25 km to the southeast of Hong Phong People's Committee.

- The area from the project to the connection point to the power grid and the connecting area to the 220kV grid of Vinh Tan - Phan Thiet is no inhabitants.

Status of the project land

Land use status:

- Mainly planting perennial trees and perennial trees of the people, partially growing crops, eucalyptus or acacia. Characteristics of the area are sandy soil, white sand so difficult for agricultural production. There are no buildings, no works or structures and no people living in the planned land.

Table 1. 2 The current status statistics of land use of the project and transformer station

No.	Type of land used	project		Trasformer station	
		area (m ²)	ratio (%)	area (m ²)	ratio (%)
1	Planting land of	1.314.615,44	62,61	86.806,94	69,45

	annual crops (wheat, peas, ...)				
2	Planting land of perennial crops (eucalyptus)	736.453,94	35,07	36.819,20	29,46
3	Vacant land	24.184,73	1,152	10,33	0,01
4	Traffic land (soil road)	24.302,54	1,158	1.363,52	1,09
Total		2.099.557	100	125.000	100

□ Technical infrastructure:

- Traffic system: transportation through the project is very convenient. In addition to the main road (DT715), there are also inter-commune roads, which are very close to the project site so it is very convenient for transporting equipment and executing works.
- Power system: not yet invested, near the project area with 220kV Vinh Tan - Phan Thiet transmission line.
- Water supply: not yet invested.
- Drainage: not yet invested, surface water mainly drains by slope in the area and seeps into sandy soil.

Assessment of the current status of the project area:

Solar power plants are built in locations with good solar energy potentiality and are favorable for transportation, construction and operation. In the project area, suitable solar panels can be installed to maximize the amount of solar energy that can be converted into electricity.

Solar power plants are located at locations compatible with the electricity system development planning and do not affect the general construction planning of the locality. Satisfying requirements on security and defense protection. Advantage for connecting to the national grid. Do not affect the neighborhood. And advantageous to expand the project.

The difficulty of the Project is very scarce surface water and underground water in Hong Phong. It is severely drought area of the province. It is required to get water from Bau Thieu, which is about 2 km away, for the needs of the project.

1.4. MAJOR CONTENT OF THE PROJECT

1.4.1. Describe the purpose of the project

Hong Phong 1 Solar Power Cluster consists of 2 Hong Phong 1A solar power plant and Hong Phong 1A solar power plant project in Binh Thuan province with the following objectives:

- Invest in building a solar power plant to exploit solar energy potential of Bac Binh district, Binh Thuan province. To supplement clean energy sources for the national power system in general and Binh Thuan province in particular.
- Develop clean energy sources to contribute to reducing greenhouse gas emissions, which is an effective alternative energy source for energy production. Apply advanced science, modern technology to produce sustainable energy.
- Contribute to increase the proportion of renewable energy in Vietnam's electricity system in general and solar energy in particular, in line with the Government's policy.
- Diversify the power supply to the electrical system in order to contribute to ensuring energy security for the system.
- It is the local power source, reducing the load for the transmission line must be remotely.
- Contribute to the socio-economic development of Binh Thuan province, contributing to the province and creating a part of the employment for local people.

1.4.2. PROJECT SCALE PROJECT

Hong Phong 1A solar power plant has total 210ha areas, installed in two areas separated by provincial road 711(expected) and has land structural as follow:

Table 1. 2 Land structural of the project

No	Kind of Land	areas (m ²)	ratio (%)
1	Land ares for construction	1.585.000	75,492

No	Kind of Land	areas (m ²)	ratio (%)
	works		
2	powerhouse	580,31	0,03
4	Distribution room	689	0,03
3	Land of internal traffic	75.000	3,572
4	Warehouse	1.500	0,0714
5	The yard	3.000	0,143
6	Land fence	105.000	5,0
7	Trees + reserve land	328.787	15,66
Tota		~ 2.100.000	100

In addition, the area of the auxiliary and turbocharged stations (main transformers) is used for both Hong Phong 1A and Hong Phong 1B solar power plants over an area of 12.5 hectares.

Main parameters of the project as following:

Bảng 1. 3 Technical parameters

No	outcome	unit	value
1	Total horizontal radiation	kWh/m ² /yr	1859,5
2	Average air temperature	°C	26,9
3	Solar panel type	-	SPR-400E-WHT-D
4	inclined module	Độ	14
5	capacity of module PV	W _p	400
6	efficiency of module PV	%	18,6
7	Solar panel temperature	°C	-40 to+85
8	Number of module	Module	10
9	Số lượng chuỗi mắc song song	Chuỗi	37.488
10	kind of inverter	-	Sunny Central 2200
11	inverter capacity	kW _{AC}	2.200
12	max efficiency of inverter	%	98,6
13	Total of module	Module	374.880
14	radiation area of module PV	m ²	810.521
15	Land area	m ²	2.100.000
16	Total capacity of module PV	kW _p	149.952
17	Number of inverter	máy	66
18	0,4/22 kV 2,5 MVA transformer	máy	66
19	22/110 kV, 125 MVA transformer	máy	1
20	22/110 kV, 63 MVA transformer	máy	1
21	First-year produced energy	MWh/year	231.324
22	Power rate (PR)	%/year	0,5
23	Productivity of power	kWh/kW _p .	1543

<i>No</i>	<i>outcome</i>	<i>unit</i>	<i>value</i>
24	Efficiency of power	%	80,85

Hong Phong 1A solar power plant includes the following items:

- Solar battery; Connection box
- DC Inverter
- Medium voltage transformers
- Cabinets (collectors, assemblies, switches, ...)
- High-voltage transformers
- National grid connection transmission system.

In addition, in order to work well, a monitoring system is needed to monitor the operation of the plant. The SCADA system displays plant information and weather information, remote control, grid parameters, etc.

Solar cell:

A solar cell is a series of photovoltaic cells that are used to convert light into electricity through photovoltaics. Silicon photovoltaic cells are made from single crystalline, higher performance and higher priced crystalline substrates or lower crystalline polycrystalline substrates, but are cheaper than single crystals.

Each solar module module is approximately 1.0x1.9m in surface made of glass, the outside is framed by metal. The front is usually treated with an anti-reflection coating.

The modules are connected by cable and run in a protective tube placed under solar cells. These cables are connected to the box located next to solar cells. The box is then pulled to connect the DC-AC converter through the large underground cables buried underground.

Based on factors such as geographic location, area of the project site (127.5 ha), weather condition of the project area, investment capital source, impact on the environment, electricity cost, selling price of the plant's power, reputation of the product, longevity and performance of the solar module, Investor selected single crystal solar for the project. Investor will use solar panels of type 1 with cell

efficiency greater than 16% and have the appropriate technical characteristics. All solar panels are guaranteed 25 years.

Specifications of single crystal battery:

+ Model: SunPower, SPR-400E-WHT-D

+ Year of manufacture: 2016

+ Rated power: 400 Wp

+ Performance of the module: 18.6%

+ Cell Performance: 20.4%

Characteristics of single crystal batteries:

<i>Technology</i>	<i>Performance of the module</i>	<i>Advantage</i>	<i>Disadvantage</i>
Single crystal batteries	15-21%	<ul style="list-style-type: none"> - The highest performance PV module - Easily available in the market - High standards 	<ul style="list-style-type: none"> - The most expensive - Waste of silicon in the production process

Solar cells made of silicon monocrystalline (mono-Si), also called single crystalline silicon (Si-crystal), are quite easily identified by a homogeneous color of the panels from the appearance, showing high purity silicon.

Single crystal cells are made of silicon ingots, in cylindrical shape. In order to optimize the efficiency and lower cost of a monocrystalline solar cell, four-sided cylindrical inserts are prepared for the silicon wafers, single cells in quadrilateral square shape making the single-crystal solar panel easy to see through this feature.

The single crystal solar panel has the highest efficiency since it is made from high quality silicon. Single crystal solar panels are effective space.

Single crystal solar panels have the longest life expectancy. Most single crystal solar panel manufacturers have a 25-year warranty.

Tends to perform better than polycrystalline solar panels rated similar to low light conditions.

□ **Solar cell structure:**

Selection of the support system for the project is a non-rotational angle fixed system. The non-rotating tilt-free system will not have mechanical moving components, so it is impossible to rotate in the sun's orbit. They are installed at a certain tilt and are fixed at that tilt. The benefits of a tilt angle fixing system are lower cost, easier operation and maintenance, and better able to withstand wind loads.

The system will be fixed on solid foundation and calculated in accordance with the geological and meteorological conditions of the project area (surface water, groundwater and storm intensity).

The structure diagram of solar project support frame is proposed as follows:



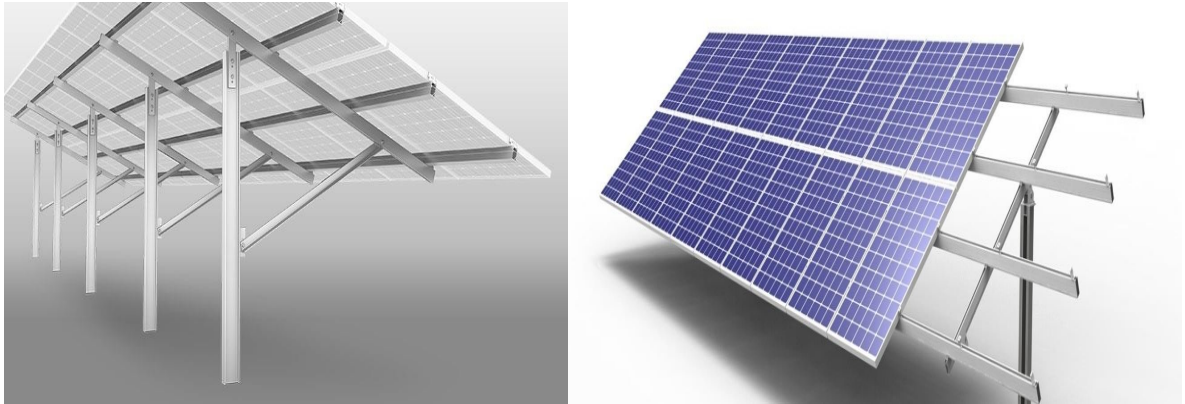


Figure 1.3 Support frame for solar panels viewed from the bottom and top

The panels of all the plants were installed in parallel rows, fixed the slanting surface of the energy receiver 14° to the south, slightly inclined to the west 8° . Due to the azimuthal angle 8° , the rows were almost in the east-west direction. Fences are install in south (or north) of the project.

Each row of solar panels is 4,160 m wide, equivalent to 2 panels mounted vertically. The gap between the rows is 1.8 m. Every 20 m, a 1-m-wide channel is installed to accommodate cable trays and connectors.

In the south area, 8 main horizontal axes (East - West) are placed through 3 factories, each axis is 8m wide. Each factory has with 3 lines which is 6m wide.

In the north area, 8 main horizontal (East - West) are placed through 3 factories, each axis is 8m wide. Each factory has with 4 lines which is 6m wide.

The operator station, the power station locate in the area on the left side of the project area to facilitate transmission grid connection.

□ DC-AC converter (inverter)

DC-AC converters are used to convert the DC power from the solar panels to AC power and are synchronized to power the grid. The DC-AC converters also control and optimize the parameters to maximize power output.

DC-AC converters can be indoors (weather resistant and mounted on a baseplate) or outdoors. In any case, ventilation and cooling systems must be equipped.

DC-AC converters for solar power plants are often provided as a turnkey integrated solution including the corresponding multi-level transformers, switches, low voltage systems, accessories placed in a container or cabin. The container or cabin is fixed to the reinforced concrete reinforcement.

The multi-level transformer corresponds to the alternating voltage levels generated by DC-AC converters (typically 300-400V) for the voltage levels of the local grid.

Investors will only use DC-AC converters of type 1 with the best specifications, highest conversion efficiency, and fully compliant with local climatic conditions. The technical characteristics of the selected equipment are as follows:

- + Model number: SMA Sunny Central 2200, using the central grid inverter of manufacturer in Germany or USA.

- + Rated power: 2200 kWac for each device

- + Max performance: 98.6%

- **Control monitoring system**

The monitoring system must provide feedback and information about the plant's operating status. Plant monitoring systems such as control and data acquisition (SCADA) systems will be housed in a cabin or office where managers and plant operators work. The cabin dimensions are 10 m long, 3 m wide, 3 m high and can be made from GRP material or built into house.

The SCADA system will, as a minimum requirement, be able to monitor and record plant parameters, enabling the installation and configuration of the DC-AC converters, changing the voltage and frequency, and performance, security for employees, monitoring system errors, solving errors and managing data loss.

- **Technical solutions for step-up station of solar power plant**

Hong Phong 1A (150MW) and Hong Phong 1A (150MW) solar power plants belong to Hong Phong 1 Hydropower Plant Cluster. These two projects are located on 350ha with 2 plots of 107 hectares and 243 hectares, estimated to build

a provincial road 711 passing between the two plots. Therefore, in order to reduce the land area for the construction of the step-up station, to reduce the investment cost and to facilitate the management and operation of the two projects, one 22/220 kV step-up station will be built named Hong Phong 1 solar power plant.

a. Power and voltage levels

- Voltage: 22/220 kV.
- Capacity: Total installation capacity 2x125 + 63 MVA

Hong Phong 1A solar power plant has 01 T3-125 MVA and T2-63MVA transformer.

b /. Electrical connection diagram

- 220 kV side: designed according to the "two bar system", the installation consists of 02 220 kV transmission line chambers and 03 MBA bays.
- 22 kV side: designed according to a diagram of a bar system.

c /. 220 kV side bays

- 02 220 kV feeding chambers for connection of 220 kV line.
- 03 220 kV MBA feeding chambers for connection of 3 step-up station.
- 01 segment cutter for 2 bars.

d /. Main equipments

- 22/220 kV - 63 MVA transformer: three phase, two coils, oil immersion, outdoor installation, 63 MVA, voltage $225 \pm 8 \times 1,25\%$ / 23 kV. ONAN/ ONAF cooling type.
- 22/220 kV - 125 MVA transformer: three phase, two coils, oil immersion, outdoor installation, 125 MVA, voltage $225 \pm 8 \times 1,25\%$ / 23 kV. ONAN/ ONAF cooling type.
- Self-Powered Transformer 22/4 kV: Power 250 kVA, oil immersion type, outdoor, $23 \pm 2 \times 2,5\%$ / 0,4 kV.

- Distribution system 220 kV: Including equipment: cutters, isolators, transformers, voltage transformers ... 220 kV distribution equipment installed outdoors.

+ Rated voltage: 245 kV

+ Rated current: 2500 A

- Distribution system 22 kV: including the cabinet installed in the home:

+ Rated voltage: 24 kV

+ Rated current: 2000 A (total road for 63 MVA transformer)

+ Rated current: 3200 A (total road for 125 MVA transformer)

+ Rated current: 630 A (feeding).

e /. Control, protection and measurement system

- The control system uses a computer-controlled method. This control system will allow the task of controlling and monitoring the operation of the equipment in the station while simultaneously performing the functions of the terminal (RTU) to communicate with the Southern power System Dispatch Center. Panels and cabinets are installed in the outdoor housing bay.

- Security system for station members complies with regulations of Vietnam Electricity Group. Main relays of circuit-based protection circuits are microprocessor capable of communicating with computer control systems and SCADA systems.

- The measurement system is fully equipped with the functions specified in the Electrical Equipment Regulations. Control systems and relay protection equipment are equipped to ensure compliance with Vietnam standards, current regulations of EVN, EVNNPT and common international standards.

f /. Measurement system to buy and sell electricity

To serving the purchase of electricity for the Hong Phong 1 solar power plant, a power metering system will be provided. The collection and service of meter data will be done by the following devices: PC with software, power counter, modem, telephone subscriber, CT box, CVT and accessories ... From the PC at the station

or the counters, the data for electricity sales of the counting machines will be sent to the information center of EVN. All power measurement systems include CT, CVT, power counters, clamps, connectors, current circuits, voltage circuits, auxiliary equipment, switching logic circuits. The information network must be sealed lead to prevent unauthorized interference.

Points of electricity measurement at the Hong Phong 1 solar power plant cluster are as follows:

- + The main metering system is located at the 220 kV line.
- + The reserve metering system is located at 220 kV MBA highway
- + The main power measurement system (without backup) is located on the 0.4 kV self-supplying power plant.

□ Electrical connection to the power system in the area:

After studying the solar radiation data from different sources, decide to use NASA data and use PVSyst software to calculate the simulation that gives the main parameters of the plant. The calculation results are described below:

Hong Phong IA energy joint stock company has 374.880 solar panels, arranged in 37.488 array (a array is 10 solar panels connected in series). The factory uses 66 inverters with capacity of 2,200 kW. Each 568 arrays connected to an inverter forms a group, each group is connected to a 0.4 / 22 kV transformer with a capacity of 2.5 MVA.

Hong Phong 1A and Hong Phong 1B solar power plant collected to 220kV line Binh Thuan province system

Electricity from 0.4/22 kV transformers in plant 1A is collected and put onto 22kV bus bar to boost voltage 22/220 kV. Hong Phong 1A power plant's substation which is (1x125+63)MVA. Hong Phong 1's power substation will be connected to National 220 kV grid.(transformer to boost voltage 22/220Kv with capacity 125+63+125MVA has built at general location of Hong Phong 1A and Hong Phong 1B solar power plant., T1 and T2 transformers of Hong Phong 1A solar power plant



Figure 1. 4 Power connection of the plant to the national grid in the area

□ **The technical solution of the connection line**

220 kV double-circuit line connected to a circuit of Vinh Tan - Phan Thiet 220 kV line.

- First point: 220 kV TBA bar in Hong Phong 1 Solar Power Plant

- Ending point: corner pole (location in 201 circuit 1) Vinh Tan - Phan Thiet 220 kV line.

+ Voltage level: 220 kV.

+ Number of circuits: 02 circuits.

+ Length of the route: 1500 m

+ Conductor: ACSR - 2x330 (synchronous with the 220kV Vinh Tan – Phan Thiet Line currently operating)

+ Lightning arresters: Use OPGW optical cable. Suitable for Vinh Tan - Phan Thiet 220 kV line currently operating.

+ Insulators: Using insulating by glass (ceramic) with corrosion-resistant zinc ring, or chain with equivalent technical features (composit ...) should ensure the parameters suitable to environmental conditions of the wire passing.

+ Columns: Galvanized steel.

+ Foundation: Foundation.

1.4.2.2. Ancillary items

A /. ground leveling:

Leveling solution:

- At the project site, the highest point in the southwest corner is about 210 meters high and the lowest point in the eastern corner is about 153 meters high. The terrain is inclined to the east and southeast. The ground leveling solution is to ensure the slope along the entire construction area.

- Ground floor leveling basic design follows the existing altitude of the whole area in accordance with the principle of digging land to fill up for the whole project.

- The terrain at the project land varies from 30m to 50m, tilted mainly toward the east and southeast. Therefore, the ground leveling basic design based on the existing high altitude of the whole area, and the principle of digging the soil to fill the entire project.

- Ground leveling at the installation site of the battery piles, pile driving area, slightly modified on the sloping surface of the terrain to the tilt requirements of the PV module. In addition, in the area of the pressure station (shared by both Hong Phong 1A and 1B solar power plants), the ground leveling is also done.

- The ground leveling work is mainly based on the balance of soil excavation and embankment in place considering the possibility of connecting roads from outside to the station.

Volume of ground leveling:

Table 1. 5 Volume of landfill calculated for the project

<i>Items</i>	<i>Volume of ecavation (m³)</i>	<i>Volume of backfill (m³)</i>
The installation area of the battery panels, piling the site	116.591	106.081
Transforer station	25.900	17.300
Roads (road access to the project and on the project site)	23.364,75	12.015
Total	165.855,6	135.396

B /. Equipment assembly area

The equipment is transported to the yards of the factory, in the area of 3.000m².

+ Solar cells in monolithic condition have cargo boxes packed according to sea transport standards and transported by trucks to the project.

+ Forklifts, mini trucks transporting batteries from yards to gather yards.

C/ Traffic system

The completed traffic network includes: internal roads to ensure convenient transportation to the design area and in accordance with the overall layout and fire protection requirements.

The project connects traffic with roads: road DT715 and provincial road 711 (expected) in the area.

D /. Electricity distribution system

A self-powered AC power source is supplied from a self-powered step-up station for 22/ 0.4 kV-250 kVA transformers from 22 kV and from the local grid.

The DC power supply in the station is provided by two nickel-cadmium (NiCd) batteries of 2x300Ah/ 5h, rated at 220V. The battery system operates in charge mode through two rectifiers. Rectifier cabinet 380/ 220VAC/ 220VDC - 100A.

E /. Water supply system

- Supply: taken from the local water supply system. For water supply for the station, the Employer will apply for permission to exploit the underground water near the station. Water will be provided by the secondary water supply method in conjunction with the water pump, water tank and pressure equipment to be installed in the pump room.

- Water demand: water supplied to the project mainly for daily life and fire prevention.

Basis of calculation:

TCXDVN 33: 2006: Water Supply - Pipeline and Works - Design Standards, Ministry of Construction.

Type of workshop	Standards for domestic water use (litre/person.shift)	Inharmonic ratio (K_{giò})
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Type of workshop	Standards for domestic water use (litre/person.shift)	Inharmonic ratio ($K_{gi\grave{o}}$)
Calorific workshop > 20 Kcalo/m ³ .giò	45	2,5
Other	25	3,0

- TCVN 4513: 1988 - Water supply - Design standard: The project has a canteen for staff, the water used for the canteen for 1 person/ meal is 18- 25 liters, estimated at 25 liters/ person/ day.

Number of employees working in the factory: estimated total number of employees working in the factory about 75 people.

Table 1. 6 Calculation of water demand

No.	Purpose of water use	Standard	Scope	Supplied water discharge (m ³ /day)
1	Water provided to the activities of employees and staff in the plant	45 liter/person.shift	75 persons	8,44
2	Water provided to canteen	25 liter/person.shift		1,875
3	Public water (watering,...)	10%Qsh		1,03125
Total				11,34

+ Water for fire protection:

According to TCXDVN 33: 2006 and TCVN 2622: 1995, the water reserve for fire fighting is calculated according to the following parameters:

- Number of fires in the same time: 2 fires.

- Fire time required: 3 hours
- Water flow: 10 l/ s
- Water supply for fire fighting: 2 fire x 3h x 3.600s x 10 l/ s = 216 m³

F /. Drainage system

- ***Waste water drainage:***

Wastewater flow:

The project's wastewater volume is equal to 100% of water supply, excluding water for irrigation, fire fighting and water leaking. Based on Table 1.6 The Project’s water demands,, the calculated volume of wastewater is estimated as follows:

Table 1. 7 Wastewater discharge from the project

No.	Purpose of water use	Provided Water flow (m³/day)	Wastewater flow (m³/ day)
1	Water provided to the activities of employees and staff in the plant	8,44	8,44
2	Water provided to canteen	1,875	1,875
Total			10,315

Drainage network

- The drainage network is separated completely from rainwater.
- Domestic wastewater from latrines shall be treated up to the prescribed standards before leading to the common water drainage system of the project and to the collecting source.

- ***Rainwater drainage***

- Building a separate rainwater drainage system for the planning area.
- The drainage and drainage ditches are designed on one side or both sides of the road. For drainage on PV site, mainly using existing conditions of original terrain without exploring and rehabilitating; grooves will be placed along the

sides of the road, and sewers, drains and sewers, etc will be placed in the appropriate locations.

- Storm water drains in the sloping direction of the project site flowing directly into the surrounding waterways and drains off the drainage system. Arrange rain water drainage pits on both sides of the road, gathering rain water into the sewers and collecting sources.

G /. Lightning protection system

- Lightning protection for the MBA by lightning arresters located near the input side of the transformer.

- Protection against lightning directly into the station by lightning strikes mounted on the gate posts and lightning collecting needles mounted on the lightning rod in the station.

- For electrical equipment outside the substation, electrical wires shall be used to protect against lightning, and in stations, office buildings shall be protected by lightning strips, in station locations, Horizontal grounding grid shall be designed to ensure contact voltage and voltage step according to the requirements of the relevant code.

- Lightning conductors are connected to the earth station of the station with twisted bare copper wires with section of 120mm².

- In order to protect against direct lightning strikes, the wiring is designed to hang two lightning strings. The protection angle between lightning strings and electric wires at the top of the pole shall be less than 20°, ensuring the required requirements.

- Lightning conductor: Use OPGW fiber optic cable. Suitable for Vinh Tan - Phan Thiet 220 kV line currently operating.

G /. Fire protection system

For areas in the plant, especially the step-up substation: methods on fire prevention, monitoring, alarm, control, fire fighting, smoke exhaust and escape doors, ... prevent the possibility of fire are designed with careful care, to be able

to extinguish the fire in the shortest time to minimize damage, and ensure safe evacuation of employees working in the factory.

Automatic fire alarm/ fire alarm system is equipped to detect the fire quickly, accurately, to notify in time in the occurrence of fire.

Fire-fighting system: includes the following items:

- + Wall fire suppression system and automatic Sprinkler.
- + Water-stop fire fighting system (Drencher)
- + Handheld extinguishers.

+ The main fire fighting system for the project is the system of compressed water pipes with a pressure of 13.5 bar inside the pipeline. Pressure at the nozzle of wall fire suppression system always contains water with pressure of 2.5 bar.

+ The spindle fire lines are divided into two areas: high pressure and low pressure, each is connected loop at the pressure divider.

Fire hydrants:

- Auto firefighting installed for the required areas.
- In the area of the booster station, building a fire fighting water tank of 150m³ capacity.

1.4.3. Describe the measure and volume of construction of the project

**** Main preparation before construction***

a. Acceptance of handing over the ground and landmark of the project

- Location: At the project construction area - Hong Phong commune, Bac Binh district.

- Participants: Investor, Design and Construction Units.

- Content of handover: The construction unit coordinates with the functional agencies to receive the necessary areas for the project implementation, confirm the handover on the design and on the site, coordinates, basic designed altitude, handover minutes, handover sequences of the ground, heart, landmarks.

b /. Organization of warehouse, camp

- The construction unit will select the suitable location for the convenience of construction management, gathering materials, equipment, construction tools and accommodation for staff and workers.

- Administrative divisions: Provide workplaces to the site management board, ensuring the overall management of the steering committee, facilitating the combination of management between the site management and technical staff of Investor.

- Campsite area: Provide living area, accommodation for staff, workers.

- Warehousing: gathering materials, equipment, construction tools necessary for the site.

c /. Material acceptance test

- Material sampling: representatives of the Investor, construction unit, material supplier make the sampling minutes.

- Experiment the physical parameters of the materials.

- After obtaining results of material testing performed by functional agencies, both parties to the contract, the construction unit shall make a record on acceptance of materials and permit the use of the construction work.

d /. Provide electricity and water for the site

- Power supply: obtain the competent agencies' permission to connect to the local power supply system and use the generator.

- Water supply for the operation of the construction site: obtain the competent agencies' permission for the exploration and exploitation of underground water in the area, or apply for permission to connect to the water supply of the localities.

e. Surveying

☞ Locate construction within the site

After determining the axis limits of the items and decide the location of the project within the premises. The construction unit will identify benchmarks that will be maintained throughout the construction process to serve future work.

Measurement is carried out regularly on the site, including all location assignments, elevations for items, construction details from formwork installations to finish the works in the final stages of the project.

□ *Geometric coordinate grid*

Geometric grid is based on the design axes. This is an important task, ensuring that the work is located in the correct position, size vertically. The grids of upper structural components are based on a grid derived from the benchmarks below which are moved upright.

□ *Deformation monitoring*

The purpose is to measure the subsidence, deformation of the structure of the building itself and adjacent works in order to have appropriate measures to deal with unusual problems may occur.

f/. The number of workers

It is expected that the maximum number of workers at the site during construction phase is about 500-600 people. To ensure order and security in the project area, the Investor will limit the workers to stay in the works, mainly using the number of workers directly from the local.

Apart from the above tasks, the contractor shall carry out other tasks in service of the construction work:

- Contact the People's Committee of Hong Phong commune to register temporary temporary absence of construction number and commit to security and order with local authorities.

- Build signboards, signs at the construction site.

 ***Construction methods of works of the project:***

- + General construction solutions:

- Mechanical construction combined with manual.

- The company will focus on all machineries as well as human resources as scheduled to accelerate the construction progress, ensure the quality of work and labor safety during the construction of items.

+ Method of detailed construction:

a. Excavation work

- The contractor will carefully prepare the conditions of safety, hygiene, convenience of the ground, put signs in dangerous places, clean the bushes, grass, roots, obstacles on the plan and proceed to plug the position limits.

- Excavation works for the following items: solar cell rack mountings, transformer substations, boost stations, inverters, underground cables, drainage hatches, fences, external and internal traffic.

- Construct earthwork and excavation works mainly by mechanical means, using earth excavating machines to design, then combine with manual excavation to create a level for excavation.

- The stages of acceptance of the work of soil, foundation will be conducted include: accept the background excavated: geometry size.

b/. Construction of foundation, pile (battery installation area, transformer base, electric pole, turbocharger, operator house, ...)

Based on weather conditions and local soil, the Investor chooses the solution for foundation construction using prestressed pile: Pile of prestressed concrete pile D400, pile number expected 93.840piles. use pre-stressed concrete pile D400, with the expected pile number of 93,840 piles. Advantages of pre-stressed concrete pile is the high load bearing capacity because the concrete in the pile is pre-stressed before increasing the tensile strength of the concrete thus increasing the waterproofing ability, anti-corrosion.

During construction, the reference point of the backbone must be measured according to the technical drawing of the pile foundation, and the reference points shall be established using a composite gauge (also known as a electronic tachometer). The method of construction of prestressed concrete piles is shown as follows:

- For pile lifting, iron chains and ligaments are required to lift the pile; iron chains are used to tie the lower parts of the pile and the ligaments will be used to

force the vicinity of upper body lifting rings and usually no longer than 300mm. It is imperative to ensure the safety of pile falling.

- Then using the pile compressor, keep the pile bottom in line with the pile position and slowly lower to the ground. After the lower part of the pile is inserted into the soil, first compress the pile with a smaller static pressure for 1-2 seconds; after the piles have gone into a certain depth in the soil, check the pile upright and firmly. For pile driving, dropping or theodolite must be used for two-way adjustment. Inclination should not exceed 0.5% against vertically. When inserting piles, tilt of the pile should be strictly controlled in the range of 0.3%; In case it does not meet the pile's tilt requirement than the vertical one, it is necessary to pull the pile and redo.

- Before installing the pile, it is necessary to set the measurements at the pile or pile support to facilitate the observation and recording during construction.

- After checking that the piles are stable, the downhill will be conducted. Based on geological conditions at the site, it is preferable to apply great pressure and tap on the pile; With increasing pile depth, the pile's deep settling speed will slow down, and the pressure can gradually increase.

- In the course of implementation, it is necessary to keep the piles and shafts on the same vertical axis, and always check the pile not to be pressed unusually.

c/. Drainage system

Construction method:

- Sewer is provided to the site foot
- Locate the sewer heart with a theodolite
- Slope of gradienter.

- Using the digging machine to dig the pit, forming the culvert. Excavated soil is loaded onto the vehicle and transported to the right place (Select some good soil to use on the back of the drain).

- After digging close to the design level, employ workers to repair the bottom of the culvert and conduct the construction of culvert foundation.

- The culvert is transported to the site without cracking and has been properly tested according to the new design requirements down the culverts, not to drain and ramp occupied the road surface. After locating the installation of culvert, digging and immediately installing the sewer to facilitate the movement of people. When down the culvert, must place the stability on the foundation, without any difference or hiccup, otherwise the heart of the sewer will be deflected, the heterogeneous joint makes the sewer intermittently will cause local scouring to moisten the road surface or stagnation in the process of putting into use.

- After the installation is complete and the Investor checks, the contractor shall fill and compact the soil to achieve the tightness designed.

d/. Lighting systems

The work is done mainly by hand.

- Construction of the lamp post
- Construction of ditches, installation of electric cables.
- Light pole installation.
- Electrical connection.

e/. Traffic road

In the South, there will be 6 (East - West) main roads with the width of 8m to the entire plant, each of which has 3 main lines 6m wide.

In the north, there will be 6 main horizontal lines (East - West), 8m wide, and 4 main roads 6m wide.

Construct the road from the assembly yard to the inverter station. After completion of the construction, the road will be repaired and converted into an operation road.

f/. Install brackets for battery panels

Installation of fixed racks: the racks are divided into columns, main beams, purlins and cross braces, ... The installation of the racks are conducted in accordance with the installation instructions of the manufacturer.

The structure of the brace and support system will be designed to withstand the load, the load from the equipment, wind load, etc. In addition, the structure of this system must be compatible to connect with photovoltaic panels and connect to other parts.

Material of the bracing system, support: besides the choice of traditional materials such as aluminum and steel, the design will consider optimal selection, application of the latest materials and must be resistant all the impact loads, light, anti-corrosion due to the impact of the environment.

g/. Install solar panels

Preparation: The access road must be convenient, the installation equipment has been transported to the required location, and the PV modules are transported to the foundation site.

Installation of PV modules: before installation, need to carefully read the installation instructions of the modular manufacturers, dismantle the modules packaging carefully and prohibit stacking; Take and place the modules gently to avoid scratches on the face, and after tucking them into the racks, adjust and tighten the bolts.

The panels are installed in parallel rows, fixed the slope of energy receiving surface is 14° inclined to the South slightly deviated to the West 8°. At the azimuth angle of 80°, the rows are located in the east-west direction, installing fence rows in parallel with the South (or North).

Each row of solar cells is 4.16m wide and equates to 2 panels mounted vertically. The gap between the rows is 1.8m; every 20 m has a 1m track to accommodate cable trays and connectors.

g /. Operation manager and inverter station

Factory operation managers include a 22kV single-stage control and distribution room. The main force-bearing structure is by a reinforced concrete frame.

The inverter station consists of inverter equipment, medium voltage and 22kV cabinets: one-storey type. The main force-bearing structure is by a monolithic reinforced concrete frame.

h/. Line connected to the regional grid

To build a 220 kV double-circuit line from the 22/220 kV booster station of Hong Phong 1A and 1B solar power plants and connect on a 220 kV double-circuit transmission line of Vinh Tan - Phan Thiet (at the pole position 201), length of 1.5km; ACSR-2x330 conductor.

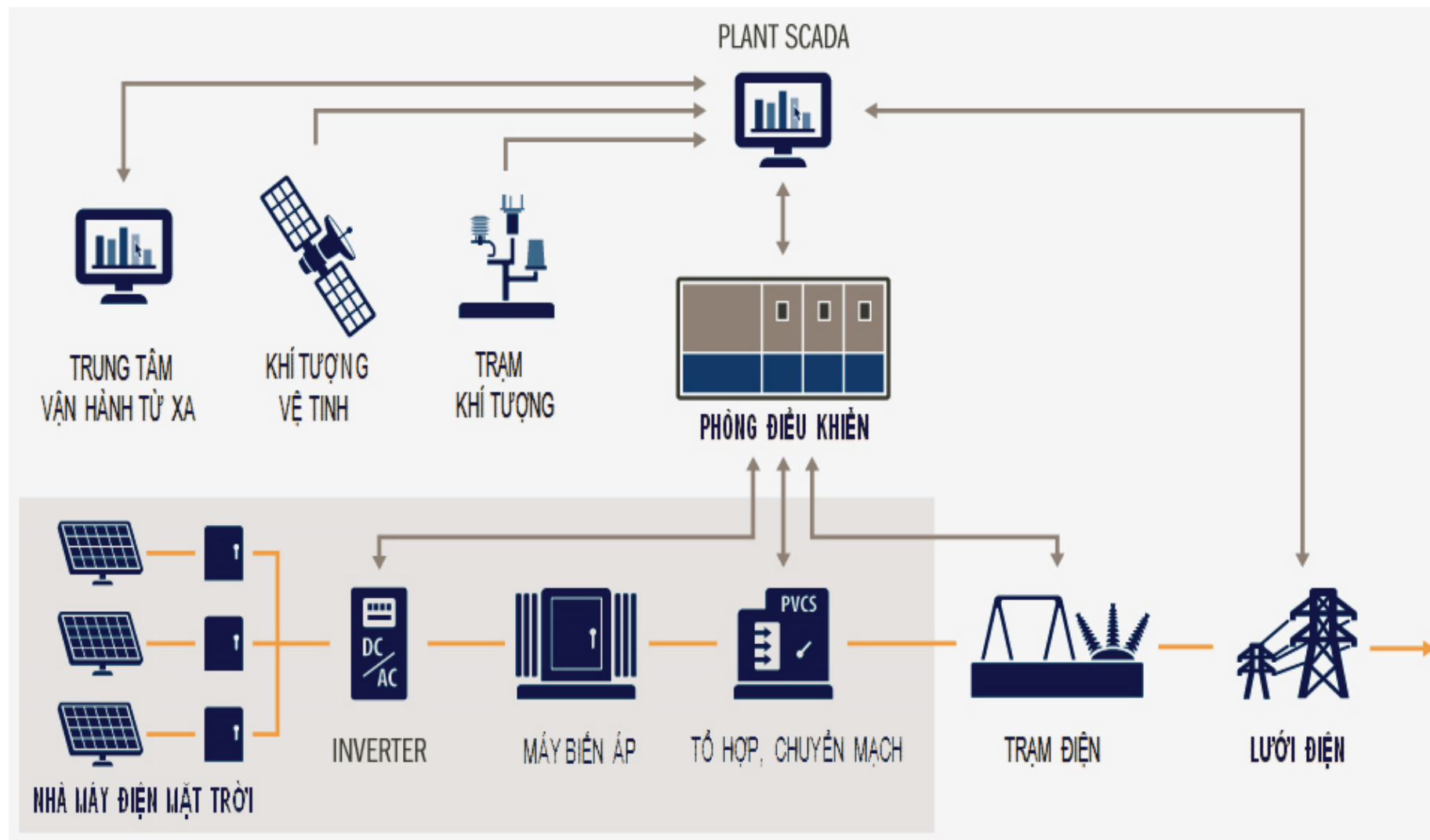
1.2.3. Production technology and operation of the project

The plant uses a photovoltaic solar panel technology installed on a non-rotating tilt angle fixation system, using a central inverter to convert DC current into AC, through 0.4/ 22kV and 22/ 220kV booster stations to connect to the electrical system.

Technology and technique of the project:

- PV Solar cell Technology: Using the SunPower single crystal technology, symbol: SPR-400E-WHT-D.
- PV inverter: Use SMA's in-grid PV inverter manufactured in Germany or USA.
- Collection transformer: Use 0.4/ 22 kV transformers to collect within the factory.
- Transformer station: Use 22/220 kV transformer to boost the voltage and transfer to the 220 kV grid.

General diagram of the solar power plant is shown below:



Hình 1. 1 Sơ đồ quy trình vận hành của nhà máy điện mặt trời

Principles of operation:

The 150 MWp system consists of solar panels installed in rows parallel to the slope calculated at Hong Phong commune, Bac Binh district, Binh Thuan province. When there is sunshine, the system absorbs solar energy and converts the energy into electricity. Then through a DC inverter (AC inverter) to convert DC into 3-phase AC with voltage 380V, frequency 50Hz, through the 0.4/ 22 kV collection transformer and 22/220 kV transformers to raise the voltage to 220 kV and join into the national grid.

1.4.5. List of machinery and equipment

□ *Pre Supplies:*

- The equipment and machinery for construction are contracted by the Employer with the local construction units.
- For specialized equipment such as: solar panels, transformers, ... are imported to the country and transported from Cat Lai port to the site. As all equipment is imported at Cat Lai Port, it is transported by road to the site. The equipment is relatively light, no super-weight equipment.

a/. Construction equipment:

Table 1. 8 List of major machinery and equipment during project preparation and construction

No	Name of machines	quantity (ps)	Fuel		Made, year manufacturing	Operation status
			DO grease (lít/shift)	Electric (KWh/shift)		
1	2,5T treadmills	3	38,4	-	2010, china	80%
2	Roller 10 tons	3	40,32	-	2010, china	80%
3	108cv machine	6	38,88	-	2012, japan	90%
4	Excavator 2.3 m3	6	137,7	-	2013, china	90%
5	Excavator 1.25 m3	6	46,5	-	2013, china	85%
6	Ironing	6	46,2	-	2012, china	80%

No	Name of machines	quantity (ps)	Fuel		Made, year manufacturing	Operation status
	machine 108 cv					
7	60T pile press	4	-	37,5	2011, china	85%
8	Automobile watering 9m3	6	27	-	2011, china	85%
9	30T crane	3	81	-	2012, japan	90%
10	Cranes 6T	6	32,63	-	2012, japan	90%
11	Generator 122KW	10	75,62	-	2011, china	80%
12	Generator 30kW	10	24	-	2013, china	80%
13	27.5cv welding machine	10	7,43	-	2013, china	85%
14	Automobile Tractor 240cv	3	48	-	2011, germany	90%
15	Concrete mixer 0.5m3	5	-	33,6	2011, china	85%
16	Dump truck 3,5T	6	28,35	-	2011, china	85%
17	Dump Truck 15T	6	72,9	-	2010, china	80%
18	Truck tanker 15T	10	46,2	-	2012, japan	85%
19	Gravel spreader 60m3 / h	4	30,2	-	2012, Việt Nam	80%
20	Concrete trucks 14,5m3	5	70	-	2012, china	85%
21	Concrete compactor 1kW	3	-	4,5	2011, china	85%
22	Brick breakers	5	-	3,06	2013, china	80%

b. Technology and engineering solutions:

Hong Phong IA energy joint stock company with 150MW has 374.880 solar panels, arranged in 37.488 array (a array is 10 solar panels connected in series) AND Single crystal technology:

- + Model: SunPower, SPR-400E-WHT-D
- + Year of manufacture: 2016 Nominal power: 400 Wp
- + Performance of the module: 18.6%
- + Cell Performance: 20.4%

Each 568 arrays connected to an inverter 2,2MW forms a group, each group is connected to a 0.4 / 22 kV transformer with a capacity of 2.5 MVA has 66 group.

- + Model number: SMA Sunny Central 2200, using the central grid inverter of manufacturer in Germany or USA.
- + Rated power: 2200 kWac for each device
- + Max performance: 98.6%

Using two 22/220 kV,125MVA+63MVA transformers to boost voltage and transfer to the conection point.

□ ***Operation period:***

Operating time, other equipment used for the operation of the plant such as computer systems, electrical cabinets, control systems for measurement protection, equipment for office work of the plant, ... These devices are being purchased new 100% from reputable brands of foreign countries.

1.4.6. Raw materials (inputs) and products (outputs) of the project

1.4.6.1. Input materials

➤ ***Preparation and construction period:***

Supplies

Construction materials for the works such as sand, stone, cement, iron, steel, electrical wires, accessories, electrical insulators ... are purchased from construction material shops in Bac Binh district, Binh Thuan province and neighboring areas.

Transport distance:

Construction materials are transported by truck from the supplier to the project site by road, with a maximum transport distance of 100km (including both trips).

The materials:

Table 1. 9 List of volume of materials used in the construction phase

No	Name of materials	unit	quantity
1	Concrete piles	piles	93.840
2	Concrete C15	m ³	543.602,50
3	Concrete C25	m ³	2.222,99
4	C20 concrete	m ³	107
5	Types of steel	tons	510.147,05
6	Area of the plaster	m ²	9.141,12
7	Cat pad	m ³	4.462
8	Grout	m ³	9.716
9	Brick types	m ²	718.322,74
10	Gravel	m ³	12.246
11	Macadam	m ³	1.440
12	Bracket plate	bộ	11.637
13	Distribution box DC	bộ	1.458
14	Steel frame racks of battery panels	tons	36.356
15	and distribution box	m	36
16	Sewer Ø1m	m	270
18	Sewer Ø0,8m	m	100
19	Precast concrete drainage	km	158
20	Power cable	km	7
21	Area fence PV	tons	5
22	Steel frame	m	400
23	The cable length of the station	tons	6
24	Lightning rods (04 sets)	tank	1
25	Oil tank (5,5m3)	tank	1
26	Water tank	tank	1

Source: Hong Phong 1energy joint stock company

➤ **Operation period**

After the completion, the solar power plant shall transmit electricity to the national power grid, there is no demand for raw materials, fuel and inputs during the operation phase. However, periodically, the station will perform the maintenance. The material can be replaced according to the manufacturer's instructions.

Workers at the factory: The plant will build auxiliary facilities for the workers' lives.

1.4.6.2. Product capacity of the factory

First year yield of Hong Phong 1A solar power plant: 231.324 MWh.

Power generation throughout the life of the project should take into account capacity reduction: in non-extreme climatic conditions such as in Hong Phong, and to simplify, we take the 0.5% reduction rate for both batteries, from the second year onwards, we have 25 years output in the table below:

Table 1.10 Electricity output of Hong Phong 1A

years	Electricity output (MWh)	years	Electricity output (MWh)
first	231.324	14	216.731
second	230.167	15	215.647
third	229.017	16	214.569
4	227.871	17	213.496
5	226.732	18	212.429
6	225.598	19	211.366
7	224.470	20	210.310
8	223.348	21	209.258
9	222.231	22	208.212
10	221.120	23	207.171
11	220.015	24	206.135
12	218.915	25	205.104
13	217.820	Total	5.449.057

- Mode of connection: Connect to the national grid
- Connection voltage level: 220 kV
- Form of electricity sale: Power sales Contract to Vietnam Electricity
- Operation time: 25 years.

1.4.7. Project implementation schedule

In December, 2017, Hong Phong 1A will start construction. Construction time is 1 year, expected in 2019 to put the plant into operation.

Table 1. 11 Project Progress

Items	Duration
Preparation of investment (bidding, design, environmental permit, construction permit, equipment installation, temporary works, site clearance, leveling ...) Preparation of construction (installation equipment, temporary works, ground clearance, leveling ...)	From 7, 2017 → January 2018
Construction items: PV modules, auxiliary equipment, inverter converters, transformer stations, operating house, ... and auxiliary works (traffic, water supply and drainage, ...) Installation of equipment	01/02/2018 → 30/10/2018
Generation of the first PV module is started	01/11/2018
All modules will be launched for power generation	12/2018

Source: Hong Phong 1 Energy Joint Stock Company

1.4.8. Investment

The total investment capital of the Hong Phong 1A power plant at capacity of 150MWp is estimated at VND2,710 billion (or US \$ 121 million). This capital includes the capital for connecting the plant to the national grid (22/220 kV transformer and 220 kV line connecting Hong Phong 1A).

Investment capital: The total investment capital for the construction of Hong Phong 1 solar cluster (including two Hong Phong 1A and 1B solar power

plants, transformer stations and 220 kV transmission line) shall be the equity and bank loans.

1.4.9. Organization of project management and implementation

Hong Phong 1 Energy Joint Stock Company is the Investor, directly managing, operating and supervising the project from the beginning of construction to operation.

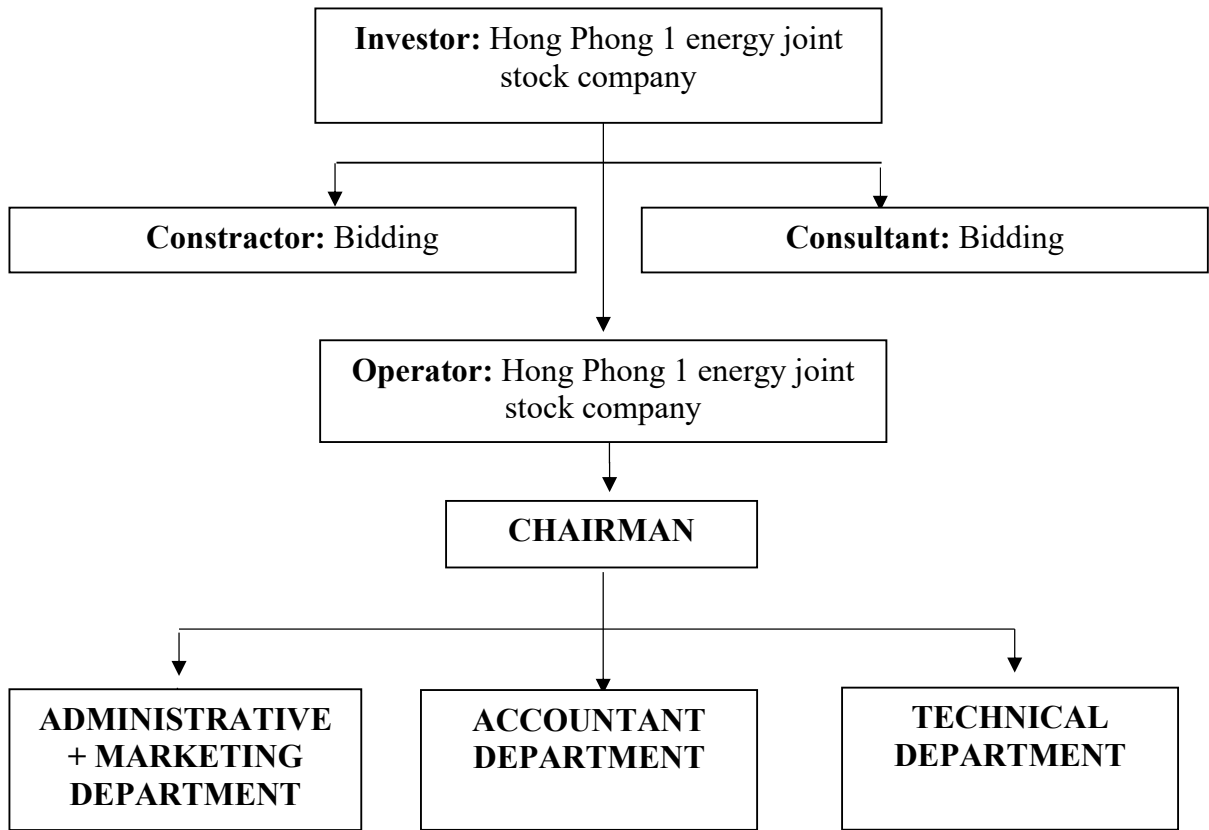


Figure 1. 6 Organization chart of project management

□ Labor demand:

- Construction phase: Estimated number of workers are working in the project includes:

<i>No</i>	<i>position</i>	<i>numbers (person)</i>
1	Management	5
2	Surveyor	5
3	Engineer	20-25
4	Driving (cranes, trucks, ...)	35-45
5	Well-training worker	30-40
6	Construction supervision	10
7	Mechanical installation workers	120-140
8	Electrical installation workers	200-240
9	Testing technician	10
10	Subscriber	50-60
11	keephouse	15-20

Total		500-600
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source: Hong Phong 1energy joint stock company

- Operation time: Leaders, engineers, skilled workers are 40 people, 35 workers general, 7 keephouses. In particular, the environmental staff for the plant in the technical department, University degree or more is 3 peoples.

<i>No</i>	<i>Position</i>	<i>Total staff</i>
1	Project management	1
2	Production manager	1
3	Technical manager	1
4	Business management	1
5	HSE Management	1
6	Engineer	15
7	Environmental staff	3
8	Well-training worker	20
9	Popular workers	35
10	Keephouse	7
Total		75

source: Hong Phong 1energy joint stock company

Summarized information of the project

Table 1. 4 Summarized statistics of the project information

Periods of the project	Activities	Schedule	Technology/ methods of implementation	Potential environmental factors
Preparation	Compensation, support for the inhabitants owning the land in the project	After the Provincial People’s Committee issues the Decision for land withdrawal	Detailed measurement - done by the Board of Compensation - Site clearance	
	Clearance of vegetation,	0,5 months	Manual combined with	- Solid waste: trees, mats,

Periods of the project	Activities	Schedule	Technology/ methods of implementation	Potential environmental factors
	site clearance		mechanical operation	materials
Construction	Excavate, cast station foundation, cable ditch Production, Installation of equipment Construction of brackets for battery panels, installation of battery panels, inverter stations, transformer stations, operation house, ...	11,5 months	Manual combined with mechanical operation	- Air environment: (Dust, emissions, noise because of construction) - Water Environment: + Domestic waste water of construction workers + Construction waste water - Earth environment: + Daily-life solid wastes + Construction solid waste + Hazardous waste - Other impacts:

Periods of the project	Activities	Schedule	Technology/ methods of implementation	Potential environmental factors
				+ Infrastructure + Security and order + Work accidents.
Operation	Production and supply of power		Operate in the form of regular watching	- The environmental impact is mainly due to the daily activities of workers (domestic waste water, solid waste). - The impact of electromagnetic fields on employees in the plant and the surrounding area.

CHAPTER 2

CONDITIONS OF NATURAL AND SOCIO-ECONOMIC ENVIRONMENT IN THE PROJECT AREA

2.1 NATURAL AND ENVIRONMENTAL CONDITIONS

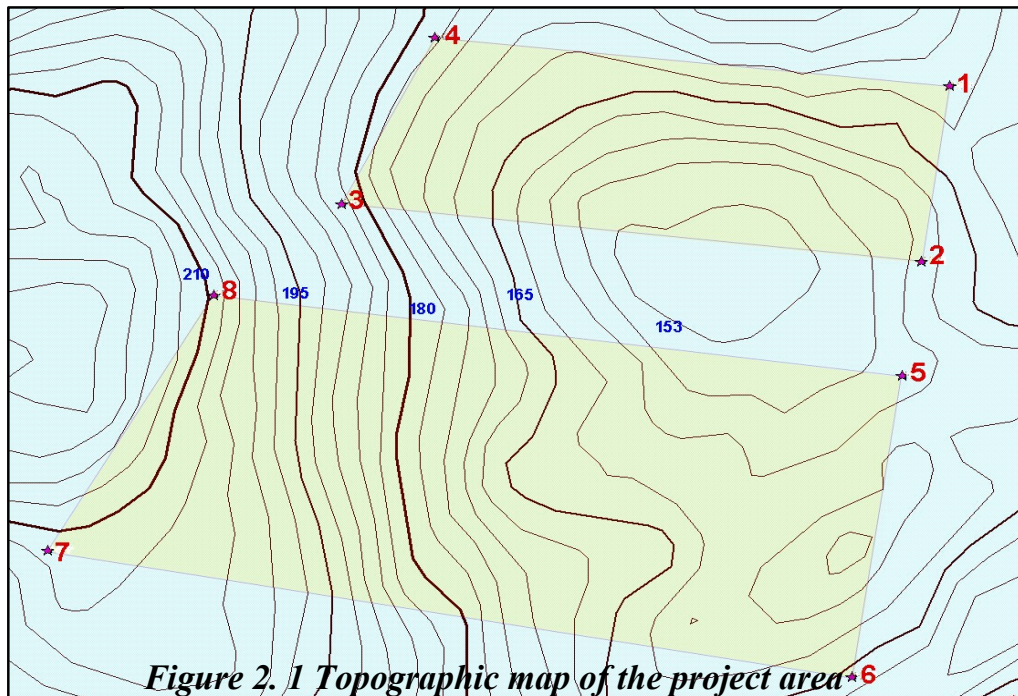
2.1.1. Features of terrain and geology

□ *Terrain:*

The whole area has relatively flat terrain. The terrain at the highest point in the Southwest corner is about 210m high, and the lowest point in the Eastern corner is about 153m high. As such, the terrain is inclined to the East and Southeast.

Surrounding the area is mostly planted with annual crops. The Western and Southwestern corner is high but sloping to the East, Northeast and Southeast without any sudden changes in height, with a difference of about 50m in length of 2.700m. Not affected by the shade of the mountains covering the solar panels.

The terrain varies in height from 30m to 50m in the large project area. Topography of the site is suitable for installation of solar power plant.



□ *Geology, soil:*

The site is located in Hong Phong commune in general with good geological conditions, the land is stable and convenient for construction. According to the land use planning document of Bac Binh district, inherited many previous survey documents and results of additional survey. there are 6 main land groups in the district as follows:

- Acrisols: This is the main land group of the district, with an area of 5,922.77 hectares, accounting for 58.03% of the natural area. Characteristics of the group of gray soil in Bac Binh district is formed on the mother stone rich quartz, alkaline poor. This soil is in the middle of the alluvial plain and low hills. Gray soil has relatively thick soil layer, sour soil (pH = 4.6 ÷ 5.5), the soil is of poor nutrition.

- Arenosols: area of 45,492.2 ha, accounting for 24.92% of natural area. Distribution mainly in Hoa Thang, Hong Phong, Binh Tan, Cho Lau, Luong Son. This is a relatively young soil, made up of rough, sparse materials, relatively sour, poor humus. This type of land has low agricultural potential, but if there are measures to improve the ability to expand the production area on this group that is relatively well.

- Ferralsols: area of 11,287.23 ha, accounting for 6.18% of natural area. The highlight of this land group is thick soil, heavy mechanical components, rich in protein and phosphorus, suitable for perennial and fruit trees.

- Fluvisols: the area of 16,571.37 ha, accounting for 9.08% of the natural area. This group includes narrow, flat land, distributed along the river. The soil is composed of light to medium-grained soils, thick soil layers, which are favorable for planting annual crops, and also adapt to perennial crops.

- Cambisols covers an area of 1,441.63 ha, accounting for 0.79% of the natural area, distributed in Phan Son. Most of the new land is being used for rice cultivation.

- Leptosols: land area of 496.0 ha, accounting for 0.26% of natural area, distributed in high terrain, steep slope, low soil fertility. This land is less meaningful in the layout of agricultural production (needs to be planted and rehabilitated).

Accordingly, Hong Phong commune is mainly sandy soil composed of raw materials, discrete, relatively acidic, poor humus soil, low agricultural potential which is eligible construction of solar power projects.

2.1.2 Climate, weather conditions

Hong Phong 1A Hydropower Plant Project in Hong Phong Commune, Bac Binh District, Binh Thuan Province, is located in the monsoon tropical zone, characteristic of the semi-arid climate in the Central South. The district is located in the Eastern and Southeastern of the Truong Son range so it is not favorable to welcome the Northeast and Southwest monsoons to cause rain. Therefore, Bac Binh district is located in the lowest rainfall area of Binh Thuan province. The climate is divided into two distinct seasons: rainy season from May to October, dry season from November to April of the following year; The average air temperature is 27.6°C and there are no cold winters.

According to Binh Thuan Provincial Statistical Yearbook 2016, the provincial climate conditions at the Phan Thiet monitoring station are as follows:

Basic climate characteristics:

- ✚ Air temperature
- Average temperature in 2016: 27.6°C
- The highest temperature in 2016 (May): 29.8°C
- The lowest temperature in 2016 (December): 26.3°C


Table 2.1 Average temperature of months in the year

Unit: °C

Years	2011	2012	2013	2014	2015	2016
<i>Average year</i>	26,9	27,2	27,4	27,2	27,4	27,6

Years	2011	2012	2013	2014	2015	2016
<i>January</i>	25,4	25,7	25,6	24,3	24,5	26,8
<i>February</i>	25	26,1	26,6	24,6	24,7	26,4
<i>March</i>	26,6	27,8	27,6	26,7	27,0	26,8
<i>April</i>	27,1	28,0	29,2	29,0	28,4	28,8
<i>In May</i>	28,4	28,0	29,4	29,5	29,4	29,8
<i>June</i>	27,6	27,7	28,2	28,0	28,6	28,0
<i>In July</i>	27,7	27,2	27,8	27,2	27,7	28,0
<i>August</i>	27,3	27,4	27,2	27,6	28,2	28,0
<i>September</i>	27,0	26,4	27,1	27,4	27,8	27,8
<i>October</i>	27,2	27,4	27,2	27,8	27,8	27,3
<i>November</i>	27,2	27,5	27,1	27,8	28,0	27,7
<i>December</i>	25,9	27,2	26,1	26,8	27,0	26,3

Source: Binh Thuan Statistical Yearbook, 2016

 Hours of sunshine

- Average hours of sunshine in 2016: 241 hours
- The highest sunny hours (April): 309 hours
- Lowest sunshine hours (December): 100 hours

Table 2.2 Average hours of sunshine per month

Unit: hours

Years	2011	2012	2013	2014	2015	2016
<i>Average year</i>	225	241	225	247	265	241
<i>January</i>	190	217	248	235	260	294
<i>February</i>	248	249	231	272	270	281
<i>March</i>	194	252	297	317	315	307
<i>April</i>	273	290	251	286	298	309
<i>In May</i>	261	277	263	299	292	262
<i>June</i>	221	218	180	203	239	221
<i>In July</i>	222	243	207	189	221	248

Years	2011	2012	2013	2014	2015	2016
<i>August</i>	276	253	219	253	292	256
<i>September</i>	183	162	170	231	239	223
<i>October</i>	241	248	230	246	257	155
<i>November</i>	226	235	209	250	239	240
<i>December</i>	163	242	198	178	256	100

Source: Binh Thuan Statistical Yearbook, 2016

Precipitation

The average rainfall in 2016 is 110.4 mm. Rainfall is concentrated in the rainy season from May to December. The highest rainfall is in October (310.2 mm). January, February, March and April are almost no rain.

Table 2.3 Average rainfall in months

Unit: mm

Years	2011	2012	2013	2014	2015	2016
<i>Average year</i>	104,8	108,6	76,1	89,0	74,7	110,4
<i>January</i>	17,4	4,7	10,7	0,0	0,0	-
<i>February</i>	-	5,9	-	-	-	-
<i>March</i>	8,9	7,5	14,9	0,2	-	0,0
<i>April</i>	4,6	133,8	97,7	31,6	0,0	1,1
<i>In May</i>	245,4	101,5	105,9	92,2	66,5	253,7
<i>June</i>	181,3	87,1	74,0	250,6	158,5	144,2
<i>In July</i>	221,8	296,4	228,6	189,3	201,4	185,1
<i>August</i>	140,5	158,9	154,5	151,1	80,5	122,3
<i>September</i>	236,7	358,1	166,8	176,7	145,0	97,5
<i>October</i>	91,2	132,3	58,7	157,2	164,7	310,2
<i>November</i>	92,5	17,1	1,6	15,5	7,6	70,1
<i>December</i>	17,4	0,3	-	3,0	72,0	140,8

Source: Binh Thuan Statistical Yearbook, 2016

Air humidity

- Average humidity in 2016: 82%
- Highest humidity (October): 87%
- Lowest humidity (February): 73%

Table 2.4 Average air humidity in months

Unit: %

Years	2011	2012	2013	2014	2015	2016
<i>Average year</i>	81	81	79	79	79	82
<i>January</i>	75	77	74	72	75	78
<i>February</i>	74	79	72	77	77	73
<i>March</i>	75	76	77	78	76	78
<i>April</i>	78	82	78	76	74	81
<i>In May</i>	82	84	79	80	78	79
<i>June</i>	83	83	81	82	79	84
<i>In July</i>	91	84	81	83	83	85
<i>August</i>	85	84	84	83	82	85
<i>September</i>	86	87	84	83	82	86
<i>October</i>	82	82	82	81	82	87
<i>November</i>	81	79	79	79	79	83
<i>December</i>	77	74	74	77	79	84

Source: Binh Thuan Statistical Yearbook, 2016

Wind

There are two major wind directions in Bac Binh district:

- + Southwest wind: from May to September, wind speed 2 - 3m/s
- + North East wind: from October to April next year, average wind speed of 4.7 m/s.
- + Dry, hot winds occur in March, April and July, August.

Due to the influence of terrain, the wind speed in Binh Thuan has a clear distinction in space. The Northeastern part of the province (Tuy Phong district, Bac Binh province) has the highest wind speed, then the wind speed

decreases from East to West, the Western part of the province is adjacent to Bao Loc plateau where average wind speed is minimal.

The situation of natural disasters, storms and droughts

Storm

Based on data of meteorological stations and storm statistics for 39 years (1977 - 2015) in Binh Thuan province, there are all 10 storms, tropical depression lands directly in Binh Thuan province (from 10.5°N to 12°N), equivalent to once every 4 years.

The number of storms and tropical depression affecting the province is 19 depressions with average frequency of 0.53, equivalent to one storm, depression per two years in Binh Thuan province. However, in the period from 1997 to 2000, every year there are storms, tropical depression. Especially there were two typhoons directly as in 1993 (KIM, MANNY); In 2000, there were 2 tropical depressions affecting the province.

Storm season in Binh Thuan province started from October to November, the frequency of typhoons and tropical cyclones most affecting to Binh Thuan province is in November (17%), followed by October (15.7%), December (11.4%). There are also hurricanes and tropical cyclones occurring early in the year, but not much as in March 1982, January 2010.

Drought

From the beginning of January to April, due to the rainy season ending early, hot sunshine lasted throughout the province, causing water shortage and drought in some localities causing water shortage in the province causing damages in some agricultural land and fruit land. Some years, the local sunshine also occurs in the months from April to July, causing drought in some localities.

In Bac Binh, drought is mainly distributed in the coastal sandy areas in the East, mainly in Hong Phong, Hoa Thang, Binh Tan, Song Luy and Luong Son communes and in the North East of Phan Lam, Phan Dien, Phan Hoa.

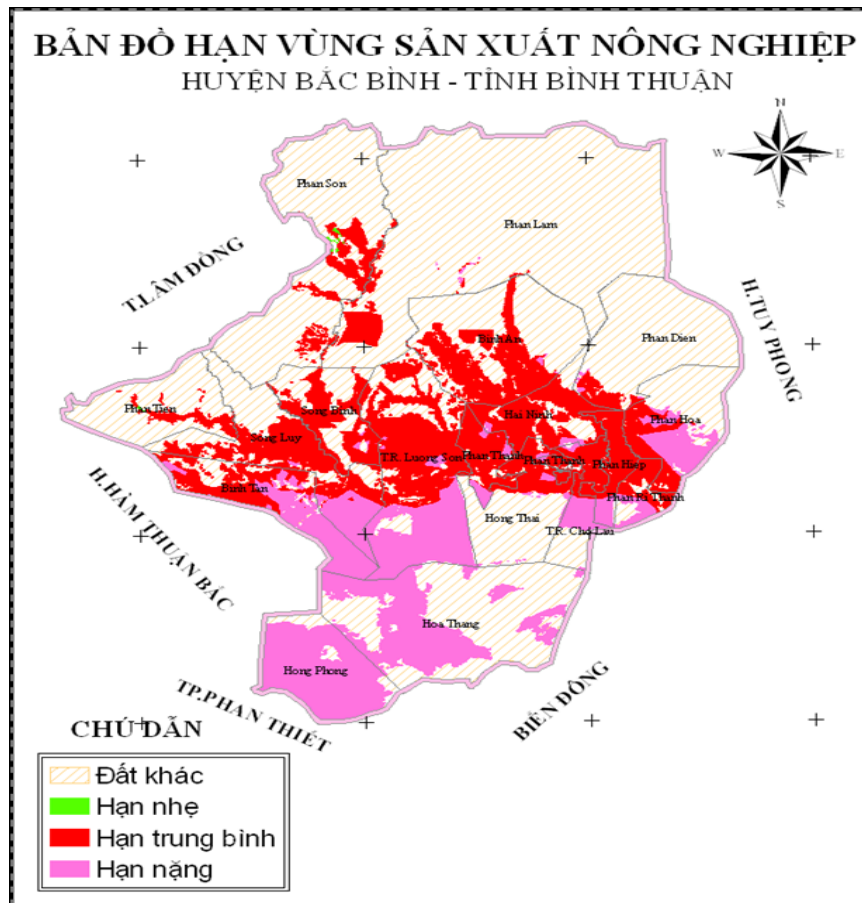


Figure 2 Map of drought in Bac Binh district

2.1.3 Conditions for hydrology

Surface water:

Due to the mountainous terrain, most rivers and streams in Bac Binh District are short and slopy, often causing floods in the rainy season and severe dehydration in the dry season. Rivers and streams in Bac Binh District belong to the Luy River system, which is the main source of water for production and daily life. At the same time, it is supplemented with water from Dai Ninh Hydropower Plant with an annual water supply of about 850 million cubic meters, which adds a huge water supply to the expansion of the production area and increase the number of crops. There are also small ponds and ponds, contributing to the accumulation of surface water for production.

Luy River originates from Di Linh Plateau flows through northwest Bac Binh district (at an altitude of 800m) down to near the Luy River railway station then enter Ca Tot river, flowing along National Highway 1A and empties into the sea at Phan Ri Cua. Luy River has a length of 78.5 km through the district, area of 1.910 km², average flow of 24.8m³/s.

Groundwater:

The status of underground water sources in Bac Binh district is not abundant, only the ability to exploit part of the demand for living. Groundwater reserve is low and varies from area to area, some places occur at depth of 4 - 8 m, some places are more than 80m deep, some places have not found groundwater. Depending on the place, each well can be exploited from 1 - 10m³/hour.

In general, groundwater resources in the district are very limited, the settlement of clean water for living and industrial production in Bac Binh district mainly rely on surface water, many places have to build remote water pipeline system.

2.1.4. Status of the quality of soil, water and air

To assess the current state of environmental quality in the project area, the Investor and consultants combined with the survey group of Tan huy Hoang Environmental Consultancy Company Limited to measure and sample on 19/10/2017 in good weather. Survey results at that time are considered "background" data used as the basis for assessing the impact of the project on environmental quality when the project comes into operation.

Information about sampling unit:

Tan huy Hoang Environmental Consultancy Company Limited, VILAS certificate no. 778, VIMCERTS 076

Address: 136/26 Dong Khoi, Quarter 4, Tan Hiep Ward, Bien Hoa City, Dong Nai Province.

(1) Air environment

✎ *Sampling location:*

Table 2.1 Air sampling location

No.	Sampling location	Sign	Coordinates	
			X	Y
1	Plot No. 1 - In the southeast, the project is adjacent to the existing path (expected provincial road 711)	K1	1224103,55	477645,48
2	Plot No. 1 - between the project site	K2	1224478,2	477016,28
3	Plot No. 1 - The west of the project is contiguous to the land for perennial crops	K3	1224626,8	476150,92
4	Plot No. 2 - The west of the project is contiguous to Hong Phong 1B Plant	K4	1223344,31	476709,84
5	Plot No. 2 – The southeast of the project is adjacent to the land of annual trees	K5	1222823,22	477455,66
6	The area is expected to build the transformer station of both 1A and 1B Solar Power Plants	K6	1223813,13	475743,11

✎ *Comparative Standards:* Ambient air quality standards - QCVN 05:2013/BTNMT, National technical standards on noise - QCVN 26:2010/BTNMT.

✎ *Describing the time of sampling*

At the time of taking these samples, it is sunny and light windy, the weather is relatively stable.

✎ *Analytical measurement results:*

Table 2. 2 Micro-meteorological results

targets Points	Temperatures °C	Humidity %	Wind speed (m/s)
K1	30,5	72,5	1,5 – 1,8
K2	31,0	74,1	1,7 – 2,3
K3	31,5	73,7	1,6 – 2,2
K4	31,3	72,6	1,7 – 2,2
K5	31,6	73,6	1,6 – 2,1
K6	31,7	74,2	1,7 – 2,3

Table 2.3 Results of noise measurement and analysis of dust and gas in the project area

targets Points	Noise	dust	NO₂	SO₂	CO
	dB(A)	µg/m³	µg/m³	µg/m³	µg/m³
K1	48,0	168	46	110	2.900
K2	47,5	170	43	114	2.700
K3	47,2	172	44	106	2.400
K4	47,0	176	41	98	2.500
K5	47,3	173	45	107	2.300
K6	47,6	178	42	105	2.600
standard of ambient air quality. (QCVN 05:2013/BTNMT)	70 (QCVN 26:2010/BTNMT)	300	200	350	30.000

Source: Tan Huy Hoang Environmental Consultancy & Trading Co., Ltd., 10/2017

Note:

- QCVN 05:2013/BTNMT: National technical standard of ambient air quality.
- QCVN 26:2010/BTNMT: National technical standards of Noise

Remark:

- Microclimate: The results of microclimate measurements of the surrounding environment at the site of the project site, showing the temperature fluctuations in the range 31,0 – 31,5°C, humidity from 72,2 – 74,1%, speed of winds 1,5 – 2,3m/s.

- Air environment: indicators such as dust, SO₂, NO₂, CO of 04 samples at the survey sites in the project area are within the permitted limits in accordance with the national technical specifications for ambient air quality. QCVN 05:2013/BTNMT. This shows that the current air quality in the area is not contaminated. As the project area is mostly blank land, perennial land and annual crops, relatively fresh air has no signs of pollution..

(2) Land quality

To assess the current status of soil quality, the survey team belongs to Tan Huy Hoang Environmental Consultancy & Trading Co., Ltd., has sampled and analyzed the soil nature within the project area on 19/10/2017.

☞ *Sampling location:*

Table 2.4 Land sampling location

No.	Sampling location	Sign	Coordinates	
			X	Y
1	Plot # 1 - In the middle of the project land	Đ1	1224478,20	477016,28
2	Plot # 2 - In the middle of the project land	Đ2	1223233,57	477181,00
3	The area is expected to build the transformer station of 2 projects of Hong Phong 1A and 1B	Đ3	1223813,13	475743,11

Equipments and method of sampling:

- The Sampling equipments: shovel, plastic bag, gloves.
- Method of sampling, storage and analysis in the laboratory in accordance with Vietnamese standards. To determine the composition of the soil in the project area, the sample was taken at a depth of 0.3 m above the ground.

☞ *Comparative Standards:* National technical regulation on limits of heavy metals in soil QCVN 03-MT:2015/BTNMT.

☞ *Analytical measurement results:*

Table 2.5 Analysis results of soil samples

No	parameters	Test method	unit	Results			QCVN 03-MT:2015/BTNMT
				Đ1	Đ2	Đ3	(Industrial land)
1	As	US.EPA Method 3050B+SMEWW	mg/kg	0,68	0,7	0,7 2	25

2	Cd	3113B:2012	mg/kg	<0,4	<0,4	<0,4	10
3	Pb		mg/kg	1,52	1,48	1,53	300
4	Cu	US.EPA Method 3050B+SMEWW 3111B:2012	mg/kg	46	49	47	200
5	Zn		mg/kg	27	23	22	300

Remark:

Land quality in the project area is assessed according to QCVN 03-MT:2015/BTNMT The maximum permitted limit for heavy metals in soils used for industrial purposes. The results of the analysis of the project land samples presented in Table 2.9 show that most of the indicators meet the standards. This indicates that the project area has not been contaminated by heavy metals.

(3) Electric field

☞ *Sampling location:*

No.	Sampling location	Sign	Coordinates	
			X	Y
1	Terminal area of the 220KV line of the project (expected) connected to the 220kV transmission line Vinh Tan - Phan Thiet	ĐT		

☞ *Measurement results:*

Table 2.6 Results of monitoring electric field

No.	parameters	units	method	results (ĐT)
1	Electric field	kV/m	Quick meter HI3604	0,0032

Source: Tan Huy Hoang Environmental Consultancy & Trading Co., Ltd., 10/2017

Comment: According to the survey, the electric field at the end of the 220 kV line of the project will be connected to the 220kV transmission line Vinh Tan - Phan Thiet relatively small. Theo Decree No. 14/2014/NĐ-CP dated 26/2/2014 of the Government detailing the implementation of the electricity law on electric safety, electric field strength in the areas where people working regularly must be smaller 5kV/m. In the metropolitan area where there are no people employed and no people, the electricity intensity does not affect the people.

2.1.5. Status of biological resources

Plants

- The status of the project land area is mainly annual and perennial land such as eucalyptus, noodles, beans and some wild plants..

Animals

- The survey shows that there are no rare species in the area.
- Animals are mainly birds, worms, mice, centipedes, bugs ... in not much quantity.

2.2. SOCIO-ECONOMIC CONDITIONS

Project area

The land plot is mainly planted with annual crops and perennial trees of the people, some are growing trees, eucalyptus trees. Characteristics of the area is sandy soil, white sand so difficult for agricultural production. There are no buildings, no buildings or structures and no people living in the planned land.

The project is about 700m to the southeast of the nearest residential area.

Hong Phong Commune

The project is located in Hong Phong Commune, as a commune of Bac Binh District, Binh Thuan Province, has a total area of 89.04 km². Location of the commune:

- The East borders with Hoa Thang and Bien Dong Communes
- The West borders with Hong Son and Ham Duc Communes
- The South borders with Thien Nghiep Commune and Mui Ne Ward
- The North borders with Hong Liem Commune

Hong Phong is one of the communes with harsh climate, complex terrain, sand dunes and hills surrounding it, making it difficult for production development. The land here is infertile, lacking in irrigation water and is often subject to adverse effects of weather such as prolonged drought, cyclones, sandy storms and so the yield of crops in agriculture and livestock is low. . Therefore, the economic life of the people in the commune is still difficult. Refer to the report on the socio-economic situation, national defense and security in the first 6 months and the direction of the task in the last 6 months of 2017 of the People's Committee of Hong Phong.

➤ **Economic situation:**

a/. Agricultural and forestry production:

In the first 6 months of 2017, people focus on varieties of crops and obtain 1086ha/1550ha reaching 70,1% of annual plan, achieving 74,9% by Resolution of the communal People’s Council and Resolution of the communal Party Committee. Increasing by 14,94% compared with the first 6 months 2016. Of which:

- Starch plant (mainly cereals plant): 25/100 ha achieving 25% of annual plan, achieving 28,4%.

- Food tree: 922/1150 ha achieving 80,2% of annual plan, achieving 80,7%.
Of which:

+ Area of pickled seeds: 590/550 ha achieving 107,3% of annual plan, achieving 116,8%.

+ Area of beans: 90/330 ha achieving 27,3% of annual plan, achieving 31,7%.

+ Area of semi-watermelon: 230/250 ha achieving 92% of annual plan, achieving 66,9%.

+ Area of vegetables: 12/20 ha achieving 60% of annual plan, achieving 120%.

- Industrial trees of many years: 50/250 ha achieving 22,2% of annual plan, achieving 61,4%.

+ Sesame: 40/190 ha achieving 21,1% of annual plan

+ Peanut: 10/35 ha achieving 28,6% of annual plan.

- Long-term industrial tree: 89/75 ha achieving 118,7% of annual plan.

+ Cashew (harvested area): 39/30 ha achieving 130%, output achieving 1 ton/ha

+ Fruit tree (custard, coconut): 50/45ha achieving 111%.

b/. Breed:

General herd in the first 6 months: 11.000 animals/12.250 animals achieving 89,8% compared with annual plan achieving 182,7%, increasing more than 34,2% compared to the first 6 months of 2016. Of which:

+ Cows: 1700/1300 animals achieving 123,7% compared with annual plan

+ Pigs: 120/350 animals achieving 34,2% compared with annual plan

- + Goats: 680/800 animals achieving 83,75% compared with annual plan
- + Poultry: 8500/10000 animals achieving 85% compared with annual plan.

At present, no epidemics appear in the area.

c/. Agro-forestry:

The sector has cooperated with the forest management board to inform people of the forest plantation area that has been completed and sent the list to the forest management board. The industry has written a notice on the prevention of crop production in summer 2017.

d/. Budget collection:

- Total budget revenue: 2.984.413.650 VND/4.533.600.000 VND achieving 65,8%.
- Total budget expenditure: 1.602.430.756 VND/3.535.600.000 VND.

e/. Issuance of Land use right

In 6 months, the Commune People's Committee has organized and considered 70.96 ha/40ha achieving 117,4% targeted by the district, 13.52% lower than the first 6 months of 2016. Of which: agricultural land is 70.9ha; Residential land is 0.059 ha.

Land statistical work: So far the land statistical work has been completed in 2016 and submitted to the district People's Committee for approval.

Project management:

- From 2004 up to now, in the commune, 21 projects have been allocated or leased by the provincial People's Committees for investment in business development, tourism and ecological forest plantation with the total area of 864, 23ha, of which 18 projects invested in tourism production and business, ecological afforestation, 03 investment projects on planting forest.
- Through this, up to now, the provincial People's Committee has recovered land of 06 projects due to no impact, investment in land. There are 05 tourism projects and 01 forest land project.
- Currently, there are 15 projects in the area, including 13 tourism projects and 02 afforestation projects. Through the results of reviewing and checking the operation of the projects. Accordingly, 02 afforestation projects have been in operation since 2011. There are 13 tourism projects in the sea area not in operation.

Land inventory and compensation:

In the first six months of the year, the People's Committee of the commune cooperated with the Bac Binh Land Development Center to carry out the

inventory and compensation for the 110kV Luong Son - Mui Ne electricity line project and the mining project. Titanic falls under Sao Mai Joint Stock Company. So far, the total number of applications has been 46 records.

➤ **Social culture:**

a/. About education: Schools hold a summation of the academic year 2016-2017. Maintain universal standard of education at all levels.

- Preschool: 78/73 children, The number of eligible students in grade 1 is 30 children 100%. The school maintains a 5-year-old preschool standard.

- Primary: 144/147 students. By the end of the school year, 144/147 students had gone to class, with 02 students moving to other places. Total number of pupils was 78 at the end of the year and 144 pupils at 54.16%. Eligible students in grade 6 are 26/26 at 100%. About 144/144 conduct rate of 100%.

- Secondary school: 91/93 students, graduates qualified 15/15 to reach 100%.

b /Health: There is one clinic in the commune, with 05 beds for treatment.

In the first 6 months of 2017, 1,436 cases were transferred, 6 cases were transferred to the hospital, 1,436 cases were covered by health insurance, 13 cases were fully vaccinated, and 13 children/165 children were affected. 7.87%; malnutrition height 23 children/165 children reached the rate of 13.93%

c /. Population and family planning: To follow the guiding spirit of the population center and the People's Committee of Hong Phong commune to develop a plan for fertility reduction and implementation. Continue to maintain the registration of 3 villages with no third or more children.

- + Total number of households: 364 households
- + Total population: 1545 inhabitants
- + Total female: 755 people/790 male
- + Total birth: 17 children.

CHAPTER 3:

ASSESSMENT AND PREDICTION OF ENVIRONMENTAL IMPACT OF THE PROJECT

The assessment of the impact of environmental impacts caused by the implementation of the Hong Phong 1A solar Power Plant, capacity of 150 MW based on the project planning as well as waste, the environmental score in the project area. The evaluation shall be conducted in accordance with each stage of operation as follows:

- The preparation phase of the project

- The construction phase of the project
- The operational phase of the project.

3.1. ASSESSMENT AND PREDICTION OF IMPACT

3.1.1. Assessing and forecasting impacts during the project preparation phase

3.1.1.1. Evaluation of the suitability of the project location with the natural and socio-economic environment in the project area

❖ Assessing the location of the project

The project of building Hong Phong 1A solar power plant with a capacity of 150MW under the Hong Phong 1 Solar Power Plant was approved by People's Committee of Binh Thuan Province in accordance with Document No. 62/06/01/2017. The location of the project has taken into account the factors:

- Land use planning: According to the land use planning up to 2020, the People's Committee of Bac Binh district has been approved by the Provincial People's Committee in Decision No. 2306/QD- People's Committee dated 26 September/2013, location registered investment Hong Phong 1 solar power plant with an area of 350 hectares is land for perennial crops, annual crops. This position is in line with the adjusted land use planning of Binh Thuan Province until 2020.
- About Titan planning: On May 24, 1977, the People's Committee of Binh Thuan province issued Official Letter No. 1923/People's Committee-KT on the location of Hong Phong 1 solar power project. Construction Trading Joint Stock Company in Hong Phong commune, in the area of titanium mineral reserves, report to the Prime Minister for consideration and approval of investment location for the construction of a solar power plant in Hong Phong commune. , Bac Binh district, Binh Thuan province in the area of titanium mineral reserves.
- Forestry planning: The location for investment is mainly perennial and annual land without planting.
- About tourism development planning: Not included in the master plan for tourism development in Binh Thuan province up to 2020 with a vision to 2030, approved by the provincial People's Committee at the Decision No. 1792/QD-UBND. People's Committee on 12/9/2012.

- Regarding solar power development planning: Hong Phong 1A and 1B solar power plants are included in the development plan for solar power in Binh Thuan province in 2020, vision to 2030 by the Department of Industry and Trade.

Besides, at the project site there is no construction, architecture and no people's housing. The status of land in the area is sandy soil, white sand difficult for agricultural production, mainly here annual and perennial crops such as eucalyptus, beans, noodles.

❖ **Evaluating functional areas in the project**

The layout of the Hong Phong 1A solar power plant is organized according to the functional areas, including the layout of the solar cell system, power house, the inverter equipment system, the monitoring system, ...

With the active nature of the solar power project, the functional items are arranged very well in accordance with the master plan of the whole area. Clear planning structure, functional area and appropriate natural conditions to exploit the potential of solar radiation of the area..

❖ **Evaluation of technical infrastructure**

The project investment creates the connection of technical infrastructure network of the project with the common network of Hong Phong commune into a complete system..

Traffic system:

The completed traffic network includes: internal roads to ensure convenient transportation to the design area and in accordance with the overall layout and requirements fire protection.

The project connects traffic with roads: road DT715 and provincial road 711 (tentative) in the area.

Electricity distribution system: The use of AC power is provided by the transformers 22/0,4 kV-250 kVA.

Water supply system: Use clean water from the local water supply pipe through the total meter into the plant's reservoir and groundwater (if any).

Drainage system: Rainwater drainage systems are separated from wastewater.

+ For wastewater: wastewater generated mainly of daily-life wastewater is discharged after being treated in the form of self-infiltration.

+ For rainwater: The rainwater drainage system shall be constructed in conformity with the current terrain of the area. Arrange rain water drainage pits on both sides of the road, gathering rain water into the sewers and

collecting sources.

Thus, the investment in the construction of the project in the current period is perfectly suited to the needs of Binh Thuan province in particular and the whole country in general and in accordance with:

+ Prime Minister's Decision No. 11/2017/QĐ-TTg dated April 11, 1977 on mechanisms to encourage the development of solar power projects in Vietnam.

+ Renewable energy development plan of the Central Vietnam up to 2020, with a vision to 2030 of the Ministry of Industry and Trade.

+ Decision No. 2068/QĐ-TTg dated 25/11/2015 of the Prime Minister approving Vietnam's renewable energy development strategy up to 2030 with a vision to 2050.

3.1.1.2. Sources related to waste during project preparation

In the preparation phase of the project, environmental impacts include:

- The impact of clearing land clearance
- Impacts caused by leveling

Objects and scales are affected during project preparation

Table 3. 1 Objects and scales are affected during project preparation

No.	Affected Objects	Affected Scale
1	Socioeconomic	- Households affected by the land included in the project: affect the economic life of the people. - Traffic situation due to the use of trucks to transport biomass generated into the project. - Security and order in the project area.
2	Air environment	- Air quality in the project area due to the operation of equipment and machinery. - Air quality along transport routes.
3	Water Environment	Wastewater causes pollution in the area
4	Earth environment	The whole area of the project land
5	Ecosystem	Vegetation and animals in the construction area of the project
6	Human	All workers on the site and around the project

No.	Affected Objects	Affected Scale
		area.

Sources of impact and activity during the preparation phase of the project are shown in the following table:

Table 3. 2 Major contamination problems and sources arising during the preparation phase of construction

Main pollutants	Origin
<i>Air pollution</i>	
SO ₂ , NO ₂ , CO, dust, noise...	From the process of liberation and leveling: the equipment, supporting means such as bulldozers, saws, excavators, .. transport vehicles into the project.
<i>Ô nhiễm nước</i>	
Domestic wastewater (BOD, COD, TSS, Ammonium, Coliform ...) Rainwater flows	From the work of the construction workers on the site Rainwater overflows the project area
<i>Pollution by solid waste</i>	
- Soil arises - Trees cleared	From surface clearing: acacia, eucalyptus, noodles and shrubs, grass growing wild in the project.
- Domestic waste (packaging, food, waste paper, bottles ...)	From the work of the construction workers on the site.

Specifically, each source of impact in each project preparation activity is as follows:

A /. Impacts caused by the process of clearing, clearance

As presented, the current status of the project land is mainly perennial land, perennial of people, some are growing crops, eucalyptus, noodles, .. and some shrubs, grass grow wild . In addition, there are no households and no other constructions.

The process of luminescence is carried out mainly by manual combined mechanical construction will generate waste is the branch tree. This has a number of effects on workers if they are not adequately equipped with labor protection equipment. These impacts include:

(1) Impact of solid waste

+ *Waste arising from the process of clearing the ground*

The amount of solid waste generated during the site clearance process is shown in the table. after:

According to biomass statistics of some crops in Vietnam conducted by the Institute of Tropical Biology in HCMC can estimate the amount of biomass by the process of clearing the ground in the project area as follows:

Table 3. 3 Volume of waste generated during luminescence and transformer station

Type of land	Area (ha)	Biomass	Biomass generated (ton)
Land by annual crops (noodles, beans, ...)	140,142	6,2 tấn/ha	868,882
Land for perennial crops (eucalyptus)	77,327	51,5 tấn/ha	3982,357
Unused land	2,420	-	
Land traffic	2,567	-	
Total	140,142	6,2 tấn/ha	868,882

- The above table shows that the total amount of waste generated from the luminescence is relatively large (2,726.55 tons). Unsustainable and rapid collection is likely to be a source of disease as this is a favorable environment for insects and other species to develop, especially mosquitoes that grow very rapidly in this environment and beyond. It also pollutes the soil environment in the area.
- Daily waste:
- Source: activities of workers in the process of clearing land.
- Volume: According to the average level, the amount of solid waste generated per capita is 0.5 kg/day. At the maximum of about 100 workers, the amount of domestic waste is estimated at 50 kg/day.
- The composition of domestic solid waste: mainly excess food, organic substances, paper, nylon, boxes ... The amount of solid waste should also be collected, collected and discarded in accordance with regulations, Otherwise, it will cause loss of scenery in the area and affect the surrounding environment.

(1) Impact on the air environment

✎ *Dust and emissions from vehicles*

Dust arising from the removal of the trees in the project, from the amount of dust deposited on the trunk, leaves. When emitted this dust will fly up and disperse into the surrounding air. In addition, dusts and emissions also arise from transportation vehicles, from equipment that aid in tree felling such as sawing machines, root excavators, etc.

Depending on the level of pollution as well as the exposure time of workers to this source of dust, there may be harmful effects on the respiratory tract and eye pain caused by dust.

The main vehicle used in this activity is truck, according to the WHO Reference, 1993 the amount of pollutant load generated for road trucks is as follows:

Table 3. 3 Pollutant load by vehicle weight

Pollutants	<i>Pollutant load by vehicle weight (kg/1000km)</i>		
	the town	countryside	Highway
<i>Vehicle load from 3,5 ton to 16 ton</i>			
Bụi	0,9	0,9	0,9
SO ₂	4,29S	4,15S	4,15S
NO _x	11,8	14,4	14,4
CO	6,0	2,9	2,9
VOC	2,6	0,8	0,8
<i>Vehicle load from > 16 ton</i>			
Bụi	1,6	1,6	1,3
SO ₂	7,26S	7,43S	6,1S
NO _x	18,2	24,1	19,8
CO	7,3	3,7	3,1
VOC	5,8	3,0	2,4

By: WHO, 1993

With the volume of waste generated is 4.851,24tons, the project owner uses 15 tons of transport means, the clearance time is about 1 months (26 days/month), the number of vehicles We need to transport 12 trip per day, with an average distance of 40 km (both on and off).

The following is a calculation of the amount of gaseous effluent arising from the operation of the vehicles:

Table 3. 4 Estimation of the amount of pollutant gases generated during the transport of biomass

Pollutant	The length of the road (km/day)	Total amount of waste (kg/day)

Bùi	40 km/trip x 12 trip/day = 200	0,42
SO ₂		0,10
NO _x		6,72
CO		1,35
VOC		0,37

Source: WHO, 1993

Note: - S = 0,05% Sulfur content in DO oil (According to Petrolimex)

Emissions from transportation mainly affect the environment and the lives of people along the transport route, which is unavoidable. Therefore, the owner of the project will apply measures to minimize the air pollution caused by the vehicle during this period.

❖ **Dust and exhaust by the operation of the surface clearing equipment**

At this stage, the project area will focus on some necessary equipment such as bulldozers, excavators, saws, ... for the ground clearance work..

Table 3. 5 Fuel use of the clearance equipment

No.	Equipment, facilities	Quantity	Amount of oil/equipment (liter/shift)*	Total DO used (liters/shift)
1	Bulldozer 110 CV	6	46	276
2	Excavator 1,25 m ³	6	83	498
3	Crane 1,25 m ³	4	47	188
4	Automobile crane (6 tons)	4	33	132
Total (1 shift /8 h)				584

Source: Decision No. 1369/QĐ-UBND of People's Committee of Binh Thuan Province dated 23/06/2011 on the announcement of price list of machine and equipment for construction of works

Note:

- *: Decision No. 1134/QĐ-BXD dated 08/10/2015 of the Ministry of Construction announcing the norms of wastage determining the price of machinery and construction equipment

- 1 shift = 8 hours

So the maximum amount of oil used in an hour is 73 liters = 63.51 kg/h (DO of 0.87 kg/liter).

❖ Calculate pollutant discharge load:

The pollutant concentration of the pollutants in the combustion gas DO is shown in the following table:

Table 3.6 Pollution coefficient of pollutants in diesel fuel oil operated machinery

Pollutants	Pollution factor (kg pollutant/grease ton)
dust	0,71
SO ₂	20 x S
NO _x	9,62
CO	2,19
VOC	0,791

Source: World Health Organization, in 1993

Note: S: Sulfur content in oil DO = 0,05% (Source: Petrolimex, in 2007).

According to the reference from the ventilation and exhaust gas treatment techniques of Nguyen Duy Dong - Education Publishing House, 1999, the volume of gas generated by burning 01 kg of DO oil at standard conditions is about 22 ÷ 24 m³ emissions/kg of oil DO.

Exhaust emissions of construction vehicles in 1 hour are:

$$Q_K = 22 \div 24 \text{ (m}^3\text{/kg)} \times 63,51 \text{ (kg/h)} = 1.397 \div 1.524 \text{ (m}^3\text{/h)} = 0,388 \div 0,423 \text{ (m}^3\text{/s)}$$

From this, the concentration of pollutants is calculated as follows:

Table 3.7 The concentration of polluted gases in the exhaust gases of the equipment and machinery clearance

No	Pollutants	Values (g/s)	Concentrations (mg/m ³)	QCVN 19:2009/BTNMT, column B, (K _p = 1,0; K _v = 1,2)
1	dust	0,013	29,6 - 32,3	240
2	SO ₂	0,0002	0,4 - 0,5	600
3	NO _x	0,170	400,8 - 437,3	1020
4	CO	0,039	91,3 - 99,5	1200
5	THC	0,014	33,0 - 36,0	-

Source: Assessment of Sources of Air, Water and Land Pollution, WHO, 1993

Note:

$$\text{Quantity (g / s)} = [\text{Pollution system (kg pollutant / ton)} \times \text{Oil consumption (kg / h)}] / 3,600$$

$$\text{- Concentration (mg / Nm}^3\text{)} = [\text{Load (g / s)} / \text{Flow (m}^3\text{ / s)}] \times 1,000$$

- QCVN 19: 2009 / BTNMT, column B; $K_p = 1.0$; $K_v = 1,2$: National technical regulation on industrial emissions for dust and inorganic substances; column B applies to baseline activities as of January 16, 2007; Quantity of waste gas $K_p = 1.0$ for waste gas emission of total discharge: $P \leq 20,000 \text{ m}^3 / \text{h}$; region number $K_v = 1,2$ for rural rural.

Impact assessment:

- Impacts of people living along the biomass route of the project:

If the owner does not take management measures during transportation, these dust particles (soil, sand) will affect the health of people living and circulating along the route.

- Impact on workers directly working on the site:

Workers who directly work on the site are directly affected by the amount of dust generated during the luminescence. However, the area of the site is wide open, so the pollution effects of this dust will be very limited. However, the employer must ensure adequate labor protection for workers in order to protect the health and work capacity of the construction workers.

(2) Impact of wastewater

+ *Domestic wastewater:*

Wastewater at this stage mainly arises from worker activities. Given the amount of biomass generated from the tree clearing process, it is estimated that the number of workers employed in this period is about 100.

Pursuant to Guideline 20 *TCXDVN 33: 2006*, the water use requirement of workers is 45 liters/person/shift. Thus, the amount of water supplied to workers is as follows:

$$100 \text{ people} \times 45 \text{ l/person/shift} \times 2,5 = 11,25 \text{ m}^3/\text{day}$$

The amount of wastewater generated each day is equal to 100% of the equivalent water level $11,25 \text{ m}^3/\text{day}$.

Composition, characteristics of waste water: Domestic wastewater and excreta are the source of many viruses, bacteria and helminths that cause human illness. As a result, when wastewater is excreted and absorbed into the soil, this is the main source of pollution for the land and ground water environment of the project area..

B/. From the leveling process

The ground leveling will cause many negative impacts on the surrounding environment such as increased density of vehicles transporting rocks; This will adversely affect the quality of traffic in the area, affecting the air environment, noise and traffic safety.

Prior to leveling, the investor will perform the removal of topsoil and rooting of trees. Land volume will be used to level the lowland areas of the project area.

Plans for supplying grounding materials:

- Land for ground leveling: The volume of ground leveling is taken from the spot inside the project. The average land clearance within the project is 0.1 ÷ 2 km.

- The volume of excavated soil: 76,500 m³

- Mass of soil: 62,800 m³

- Surplus soil volume after filling the area to be leveled: 13,700m³, this excess area is used to fill the lowland areas inside the solar power plant cluster 1A and 1B and no transportation is required. outside.

(1) Impact on the air environment

❖ Dust and emissions from the transportation of raw materials to leveling

Source and composition

Dust and emissions arising from the use of trucks transporting soil backfill within the project. Truck transportation will generate pollutant gases that contain products from combustion of engines such as dust, NO₂, SO₂, CO and VOC. The pollutant load of these emissions is more or less dependent on the number of vehicles involved and the type of engine fuel used. In addition, the impact of noise and traffic safety on the road.

- The volume of land to be transported to the area to be covered within the project is 203.094tons. Duration of leveling about 1.5 month, estimated 1 day need about 325 trucks with a load of 16 tons during ground leveling, the distance about 0,1 ÷ 2 km.

- The volume of land to be transported to the other area to be covered within the 1A and 1B project is 30.459,75m³ equivalent 45.689,53tons. Duration of leveling about 1.5 month, it is estimated that about 325 turns of trucks with a capacity of 16 tons, the distance of 0.1 ÷ 2 km.

- The amount of excess land to be transported to other areas in the 1A and 1B solar power plants is 30,459.75m³ equivalent to 45,689.63 tons. It takes about 1.5 months for landfilling, it is estimated that about 73 turns of trucks with a load of 16 tons in the distance of about 1 ÷ 5 km per day are needed.

Note: The density of the soil is 1.500 kg/m³ (Source: Chau Ngoc An – Soil mechanics – National University Publisher, 2010)

Pollutant load:

Pollutant load depends on vehicle tonnage, vehicle usage duration and mileage. Refer to pollutant load calculations based on "Pollution Factor" provided by the US Environmental Protection Agency (USEPA) and the World Health Organization (WHO) tại *Table 3.5 Load calculating pollutant by vehicle weight*

With the number of vehicles as calculated above, it is estimated that the pollutant discharge load is generated as follows:

Table 3.8 Load of pollutants from land transport vehicles

No	Pollutants	Land Transportation inside project		Land Transportation from to other locations inside 1A and 1B plants	
		Distance transportation (km)	quantity (kg/dated)	Distance transportation (km)	quantity (kg/dated)
1	Bụi	325 trip/date x 0,1-2 km/trip= 32,5-650	0,03-0,05	73 trip/dated x 1-5 km/trip = 73-365	0,001-0,0025
2	SO ₂		0,0001-0,0024		0,0003-0,0013
3	NO ₂		0,38-0,59		0,0102-0,0281
4	CO		0,15-0,24		0,0041-0,0113
5	VOC		0,12-0,19		0,0033-0,0089

Remark:

The amount of dust and gas generated by the means of transport during the leveling is not too high. In addition, the main means of transportation within the project area, so it does not affect the surrounding area.

❖ *Dust diffuses from the leveling process*

As reported the total amount of soil fill in the leveling process for the project area is 62,800 m³ equivalent to 94,200 tons.

According to the American Environmental Protection Agency's Emission Inventories, in 1995, the emission factor for piles was calculated using the following formula:

$$E = k(0,0016) \frac{\left(\frac{U}{2,2}\right)^{1,3}}{\left(\frac{M}{2}\right)^{1,4}} \text{ (kg/ton)}$$

Of which:

E: is the dust emission factor for 1 ton of material (kg / ton)

k: dimensionless coefficient for dust size (k = 0.74 for particle size <30 µm);

U: Average wind speed (m / s), U1 = 2.0 m / s; U2 = 3.5 m / s

M: Average humidity of backfill material (3%)

We have:

- At the rate of wind U1 = 2.0 m / s: E = 0.0006 kg / ton

- At the rate of wind U2 = 3.5 m / s: E = 0.0012 kg / ton

- Total dust generated during leveling (26 days)

= Pollution coefficient (kg / ton) x Quantity of material leveled (tons / day)

+ At the wind speed of 2.0 m / s:

Dust load = 0.0006 x 94.200 / 26 = 2.14 kg / day = 268.5 g / hour

+ At a wind speed of 3.5 m / s:

Density = 0.0012 x 94.200 / 26 = 4.45 kg / day = 555.84 g / hour

- The average dust concentration in 1 hour is equal to the total site and the height is 10m: = g (hour) x 1 hour x 103 / V (m3) + background (mg / m3)

= ((265.8 ÷ 555.84g / hour) x 1 hour x 103 (12,750,000)] + (0.163 ÷ 0.172 mg / m3)

= 0,184 to 0.215 mg / m3

Of which:

+ V is the impact volume on the project site:

V = S x H = 1,275,000 m2 x 10m = 12,750,000 m3

+ Concentration of background dust measured at the project: 0,163 ÷ 0,172 (mg / m3) (in item 2.1.4 Status of environmental quality, Chapter 2)

With the above calculation results, the concentration of diffused dust from the gathering of fill material is within the limit allowed by Decision No. 3733/QĐ-BYT on working environment (8mg/m³) and higher Compared with the standard QCVN 05: 2013/BTNMT (1 hour average concentration of 0.3 mg/m³).

As a result, the amount of biomass generated during the preparation phase is within the permitted limits in accordance with QCVN 05:2013/BTNMT – national technical standard for ambient air quality (Average dust concentration within the allowable limit is 0.3 mg/m³ on average and the Standard No. TCVSLĐ 3733/2002/QĐ-BYT (total dust concentration is 8 mg/m³ meanwhile respiratory dust concentration 4 mg/m³).

❖ Emissions from construction equipments

Emissions from combustion of engines such as bulldozers, excavators, rollers, and contaminants include NO_x, SO₂, CO, CO₂, C_xH_y.

Calculation of load, concentration: Volumetric, the concentration of these gases is estimated relative to a module unit of equipment for the construction work is running synchronously in the same day. As results are at the Table 3.7.

Table 3. 90 Table of fuel consumption norms of a number of construction equipment for ground leveling

No	Equipments	Numbers (pcs)	Grease Lượng dầu/ machine (litle/work times)	Gease total DO used (litle/work times)
1	Bulldozers ≤ 110 cv	6	46	276
2	Excavator 1.25 m3	6	83	498
3	Lu 10 tons	3	34	102
4	Machine 108cv	6	39	243
Total			1 shift (8 hour)	1.110

Source: Decision No. 1369/QĐ-QĐUB of the People's Committee of Binh Thuan province on 23/06/2011 on the announcement of price list of machines and equipment for construction of works

So the maximum oil usage for 1 hour approx 44,5 lít/h = 38,7 kg/h (specific gravity of the oil DO is 0,87 kg/lít).

- According to the reference from the ventilation and exhaust gas treatment techniques of Nguyen Duy Dong - Education Publishing House, 1999, the volume of gas generated by burning 01 kg of DO oil at standard conditions is about 22 ÷ 24 m³ emissions/kg of oil DO.

- Exhaust emissions of construction vehicles in 1 hour are:

Q = amount of oil consumed (kg/h) x amount of gas produced when fully burned 1 kg of oil V(m³/kg)

= 38,7 (kg/h) x 22 ÷ 24 (m³/kg) = 851,73 ÷ 929,16 m³/h = 0,24 ÷ 0,26 (m³/s)

Based on fuel consumption norms and pollution coefficients, the loading and concentration of pollutants in the combustion gases of DO are as follows:

Table 3. 10 Load and concentration of pollutants from oil burning process DO

No	Pollutants	Values (g/s)	Pollutants concentration(mg/m ³)	QCVN 19:2009/BTNMT, column B, (K _v = 1,0; K _p = 1,2)
1	dust	0,024	29,58 – 32,27	240
2	SO ₂	0,0003	0,42 – 0,45	600
3	NO _x	0,323	400,83 – 437,27	1020
4	CO	0,073	91,25 – 99,55	1200
5	VOC	0,027	32,96 – 35,95	-

Source: Assessment of Sources of Air, Water and Land Pollution, WHO, 1993
Note:

- Load (g/s) = [Pollution factor (kg of pollutant/ton of oil) x Amount of oil used (kg/h)]/ 3.600
- Concentration (mg/Nm³) = [Load (g/s)/Flow (m³/s)] x 1.000
- QCVN 19:2009/BTNMT, cột B; K_p=1,0; K_v=1,2: National technical regulation on industrial emissions for dusts and inorganic substances; column B applies to operating establishments as from January 16, 2007; coefficient of flow of waste K_p = 1,0 It corresponds to the total discharge of the waste stream: P ≤ 20.000 m³/h; area coefficient K_v = 1,2 for rural area.

The results show that the load, concentration of pollutants is not large. This type of pollution is usually not large due to dispersion in large, open environment and And the project location is far from the residential area . Therefore, the impact on the area around the project land is negligible, which directly impacts workers who are working on the site..

(2) Impact on water environment

+ Domestic wastewater:

Wastewater at this stage mainly arises from the daily life of the workers to fill and fill, estimated number of workers working in this period is about 50 people.

Water consumption of workers is 45 liters/person/shift. Thus, the amount of water supplied to workers is as follows:

50 people x 45 litres/person/shift x 2,5 = 5,625 to 6,75m³/day

The amount of wastewater generated each day is equal to 100% of the equivalent water level 5,625 to 6,75m³/day.

Composition, characteristics of waste water: Domestic wastewater and excreta are the source of many viruses, bacteria and helminths that cause human illness. As a result, when wastewater is excreted and absorbed into the soil, this is the main source of pollution for the land and ground water environment of the project area.

(3) Impacts of solid waste

The amount of solid waste generated during this period is mainly domestic waste, calculated on average per capita of 0.5kg/day. Therefore, with the number of 50 workers working on the site, the amount of rubbish is estimated at about 25 kg per day. Ingredients: mainly redundant food, organic matter, paper, nylon, boxes ... The amount of solid waste is not much and only occurs during the leveling of the waste but also need to concentrate. Collected and discarded in accordance with regulations.

3.1.1.3 Non-polluting sources

✍ Impact due to compensation for site clearance

Affecting the land

The project is built in Hong Phong commune, Bac Binh district. The area of land that is expected to be permanently recovered is mainly perennial and perennial land of the people, currently being planted with eucalyptus, cassava, beans, etc

Type of land	The project	substation
Land by annual crops (whets, peas, ...)	1.314.615,44	86.806,94
Land for perennial crops (eucalyptus)	736.453,94	36.819,20
Unused land	24.184,13	10,33
Land traffic	24.302,52	1.363,52
Total	2.099.557	125.000

- There are no houses or structures in the project area, so it does not affect the houses and architectural works of the households in the project area, except for the above mentioned area. Therefore the project is not resettled.

The sources of impact that may arise during this phase are:

- Occupying land for the construction of factories: crops, trees within the area occupied permanently.
- Compensation assistance for site clearance reduces the land fund, damages the assets on land, affecting the economy, income ... of the people.
- Changing employment of people living in the project area;
- However, due to the characteristics of the area is sandy soil, white sand, so it is difficult for agricultural production. And the land acquisition for the solar power plant brings socio-economic efficiency to the locality, so the impact of the project on the households due to land acquisition is low.

☞ Change the ecological environment of the area

The process of clearing, leveling basically transforms the ecosystem of the area, causing the loss of natural vegetation in the area. At the same time, some animals are lost at the same time, it takes a long time for a new ecosystem to form and develop..

Affect the flora

Freeing, leveling the ground has led to the loss of natural vegetation in the area. This change also meant the destruction of the existing vegetation of the area of trees such as cajuput, noodles, some shrubs, etc.

Destruction of trees will also reduce the ability of the area to air. However, the investment in the project brings a lot of social value, and still creates a new green space for the area while paying attention to the environmental protection and the development of the State.

Affect the fauna

Removal of trees in the project area will affect the growth and development of birds, resulting in loss of habitat, especially at the time of incubation. Animals as well as wildlife are susceptible to pollutants that can kill some species. In addition, gravel operations, road construction create disturbance, changes in living conditions (temperature, light, dust, noise, ...), some terrestrial species will decline gradually or moved to other places.

In the process of liberation, leveling will focus on a large number of workers. The daily activities of the workers as well as the construction equipment of the construction site will cause pollutants polluting water sources, air pollution, soil environment..

☞ Impact of noise and heat

The clearance and leveling process will use vehicles and machinery to clear and transport the inevitable noise generated by these operations by

excavators, bulldozers, leveling machines. With the resulting noise it is possible to affect the surrounding environment. Actually in the project area is mainly cassava, noodles so the quality of life of people here is not much.

Noise generated mainly directly affects the construction workers, so the construction contractor should be equipped with labor protection equipment for workers to work.

The effects of heat pollution: Due to long-term work in the sun, workers are exposed to the effects of solar radiation, which causes rapid fatigue, thirst, and headaches. This leads to a decrease in labor productivity and an increase in the likelihood of accidents.

✍ Impact on regional traffic

Impact on the traffic situation in the area (accidents or traffic jam) due to the increase in the density of means of traffic on 715 provincial road and trail into the land: from the activities of transporting waste lighting equipment, construction equipment, and transportation of workers. This increase will result in an increase in the pollutant load, which reduces the ambient air quality. This is the inevitable impact

Impact on drainage and flooding in the area

A significant impact during ground leveling is local inundation, if the time for leveling occurs during the rainy season and affects drainage in the project area.

The whole area has relatively flat terrain. The highest point in the southwest corner is about 209m, and the lowest point in the eastern corner is about 160m high. As such, the terrain is inclined to the east and southeast.

In the area with the highest point 210m in the southwest corner, the area around the area is mostly planted with annual crops. The western and southwestern corner is high but sloping to the east, northeast and southeast without any sudden changes in height, with a difference of about 50m in length and 2.700m in length.

The survey showed that most of the planning area is acacia and eucalyptus, there is no flooding in the rainy season and the drainage problem is relatively favorable. the topography of the area and seep into the soil.

In addition, the leveling plan is designed in the direction of natural topography to avoid inundation and loss of sand leveling, ensuring not flooding the planning area and neighborhood.

3.1.2. Evaluate and forecast impacts during the construction phase of the project

- Construction of a temporary road to the project site, temporary office, camp, warehouse, transport equipment, construction machinery, crane installation,...

- Construction of the solar power plant items:

- + Operation- office house, transformer station, inverter station, foundation excavation (foundation foundation, foundation equipment, foundation oil tank, transformer foundation, ...)

- + Concrete work, plastering, erection of poles, installation of systems of panels, installation of insulation, accessories, machinery and equipment for the station.

- + Ancillary works (internal and external roads, water supply and drainage system, electricity supply system, communication system ...).

- Construction of the power transmission line connected to Vinh Tan-Phan Thiet 220kV grid: construction of electric pillar foundation, foundation excavation, formwork installation, foundation reinforcement, poles, insulators, accessories, spreading (wiring and sagging).

With the above workload, the project area will focus on a number of equipment, means of construction and labor. All of these factors can have a negative impact on the environment not only in the project site but also in the surrounding area

With the above workload, the project area will be equipped with a number of equipment, construction machinery and construction labor. All of these factors can have a negative impact on the environment not only in the project site but also in the surrounding area.

Objects and scales affected during the construction phase of the project are as follows:

Table 3. 112 Objects and scales are affected during the construction phase of the project

No.	Affected Object	Affected scale
1	Air environment	<ul style="list-style-type: none"> - The quality of the air in the project and the surrounding area is influenced by the influence of the wind and the propagation process - Air quality along the routes of transportation of construction materials, equipment
2	Water Environment	<ul style="list-style-type: none"> - The process of construction of the project will generate waste water, and stormwater runoff on the site dredged dust, directly

No.	Affected Object	Affected scale
		affecting the quality of groundwater in the project area.
3	Earth environment	- All land in the project area
4	Socioeconomic	- Affect traffic safety in transportation of construction materials. - Affect security and order in the project area.
5	Human	- All workers on the site, households as well as people along the road transport.

3.1.2.1. The source of the impact is related to the waste

Table 3.123 Major pollution problems and sources arising during the construction phase

Main pollutants	Origin
<i>Air pollution</i>	
SO ₂ , NO ₂ , CO, bụi....	From the burning of fuel to the operation of means of transport
Dust...	From the process of gathering building materials
Noise	- Activities of construction machines and equipment - Noise of vehicles
Heat	Process of heating: welding, cutting, melting, asphalt ...
Pollution water	
Domestic wastewater (BOD, COD, TSS, Ammonium, Coliform ...)	During the work of construction workers, batching area
Construction waste (grease, TSS ...)	From the process of washing vehicles, construction machines
Rain water	Rainfall flows in the area
Pollution by solid waste	
Domestic waste (packaging, food, waste paper, bottles ...)	During the worker's life
construction waste(soil, steel, cimenet..)	From the process of construction

Main pollutants	Origin
Hazardous waste(paint, paper....)	From the process of construction

Pollution problems and origin in the construction phase are assessed in detail as follows:

(1) Impact on the air environment

The source of air pollution in the construction phase consists of two sources Mainly:

- Mobile pollution: trucks transporting materials (sand, stone, cement, steel ...), unloading raw materials and trucks transported internally in the construction site.
- Relatively stable sources of pollution: construction equipment (road roller, compactor, bulldozer, crane, generator ...)

☒ Dust diffuses from the excavation process

In the process of construction such as the foundation of the operator, equipment rack, oil tank incident, power pole, iverter station, power cables, battery panels, lightning protection, external and internal traffic. Dust and exhaust generated by excavation and land transportation during construction. Expected quantity of excavated soil is:

Quantity of excavated soil (m3)	Average soil density (kg/m3)	Quantity of excavated soil (ton)
3.443.330	1.500	5.164.994,36

Source: Hong Phong 1 Energy JSC

Note: The density of soil is 1,500 kg/m3 (Source: Chau Ngoc An - Soil Mechanics - National University Publisher, 2010)

Thus, the estimated quantity of excavated soil is: 5,164,994.36 tons

Table 3. 13 Coefficient of dust generation in construction

No.	Dust creating sources	Coefficient of emission
1	Excavation, ground leveling (dust, sand ...)	1 ÷ 100g/m3
2	Activities of loading and unloading construction materials (cement, soil, sand ...)	0,1 ÷ 1g/m3
3	Transporting sand, soil, scattered on the road	0,1 ÷ 1g/m3

(dust, sand ...)	
------------------	--

Source: *Rapid inventory technique in environmental control, WHO, 1993*
Assessment of dust emission:

Based on the emission factor and the amount of soil excavated during the construction of the foundation, the estimated amount of dust entering the air during this period is as follows:

With the construction time of about 9 months (work 26 days/month and 8 hours/day), the amount of dust generated is estimated:

$$3.443.330 \text{ m}^3 \times (1 \div 100\text{g/m}^3) / (9 \times 26 \times 8)\text{h} = 1.839,4 \div 183.938,55 \text{ g/h}$$

Average dust concentration in 1 hour corresponds to the whole site and the dispersion height is 10m:

$$= \text{Weight (g / h)} \times 1 \text{ hour} \times 10^3 / V \text{ (m}^3) + \text{ground data (mg / m}^3) = 0.3 \div 8.4 \text{ mg / m}^3$$

Where:

+ V is the impact volume on the project site:

$$V = S \times H = 2.224.556,6 \text{ m}^2 \times 10\text{m} = 22.245.566 \text{ m}^3$$

+ Ground measurements measured at the project site: 0.168 to 0.178 mg/m³ (see Section 2.1.4 Status of Environmental Quality, Chapter 2)

The above results show that the dust concentration at this stage exceeds the permitted level, compared with the working environment (8 mg/m³) and QCVN 05:2013/BTNMT (average dust concentration in 1 hour is 0,3 mg/m³)

This shows that the amount of dust dispersed during this period will directly affect the workers at the site. However, the concentration of dust generated in this process depends on the method of construction, the weather and the nature of the soil. Therefore, the Employer should take measures to limit the amount of dust spreading around.

□ ***Dust diffused from the process of material gathering:***

The amount of dust caused by the piling of the pile is rather large, however, due to the large area of the project and the lack of concentration, the surrounding dust will be limited.

The ability to disperse dust during this period directly affects workers working on the site and may affect the surrounding area. Therefore, the owner should cover the area of material collection to limit the amount of dust spread out of the site.

□ ***Dust and emissions from transportation of construction materials***

Stationary sources:

Emissions arise mainly from the use of trucks to transport building materials.

Ingredient:

Means of transportation into and out of the project using mainly fuels are petrol and diesel. The fuels are almost completely burned or polluted. The composition of pollutants in the exhaust gas from the main means of transport is SO₂, NO_x, CO_x, Hydrocarbons and dust. Emissions will depend on the technical characteristics of the vehicles. In addition, it depends on the operating mode (at startup, fast run, slow running, when braking - braking).

Load, concentration:

Pollutant load depends on vehicle tonnage, vehicle usage duration and mileage. Refer to the pollutant load calculated on the basis of the "Pollution Factor" provided by the US Environmental Protection Agency (USEPA) and the World Health Organization (WHO) at Table 3.5. according to the vehicle load.

This impact is identified at an average level and can be controlled and mitigated by appropriate measures, as shown in the following section.

☞ Dust from concrete mixing process

In the construction phase, the project will use concrete mixers in place for the construction of construction items. Concrete is a mixture of cement, sand, stone and water. Concrete mixers that use electricity are electric, thus generating no emissions from the operation of the machine. However, the amount of dust generated from the loading of the material affects workers at the site as well as the environment in the project area. Therefore, the Employer should take measures to mitigate this impact.

☞ Dust and exhaust from equipment, construction machinery at the site

Emission sources: Activities of construction vehicles and equipment such as compactors, excavators, rollers, cranes, generators, etc. in the project area generate dust and emissions.

Composition: Exhaust emissions from the combustion of fuels operating on site are mainly CO, SO₂, NO_x, VOC and dust.

Load, concentration:

The calculation process of the load mentioned below is only assuming that the equipment and means of construction on the construction site are operating in the same day. The concentration of substances in the exhaust gas

is calculated at the discharge mouth of each equipment and means of construction.

Table 3. 15 Combined DO use of some equipment and vehicles used in the construction phase of the project

No	Equipment, vehicle	Quantity (pc)	Unit of grease for operation (litle/ shift)	Total of DO grease for operation (litle/ shift)
1	Treadmills 12,5T	2	38,4	115,2
2	Roller 10 tons	2	40,32	120,96
3	Machine 108cv	2	38,88	233,28
4	Excavator 2.3 m3	4	137,7	826,2
5	Excavator 1.25 m3	5	46,5	279
6	Ironing machine 108 cv	3	46,2	277,2
7	Automobile watering 9m3	4	27	162
8	Crane 30T	5	81	243
9	Cranes 6T	5	32,63	195,78
10	Generator 122KW	3	75,62	756,2
11	Generator 30kW	5	24	240
12	welding machine 27.5cv	10	7,43	74,3
13	Automobile Tractor 240cv	2	48	144
14	Dump truck 3,5T	4	28,35	170,1
15	Dump Truck 15T	4	72,9	437,4
16	Truck tanker 15T	4	46,2	462
17	Gravel spreader 60m3 / h	4	30,2	120,8
18	Concrete trucks 14,5m3	6	70	350
Total			1 shift/8 hour	5.207

So the maximum amount of oil used in an hour is 650 liters = 565,584 kilograms per hour (DO of 0.87 kg per liter).

According to the reference from the ventilation and exhaust gas treatment techniques of Nguyen Duy Dong - Education Publishing House, 1999, the volume of gas generated by burning 01 kg of DO oil at standard conditions is about $22 \div 24$ m³ emissions / kg of oil DO.

Exhaust emissions of construction vehicles in 1 hour are:

$$QK = 22 \div 24 \text{ (m}^3 \text{ / h)} = 3.5 \div 3.8 \text{ (m}^3 \text{ / s)} \times 650 \text{ l / h} \times 0.87 = 12.443 \div 13.574$$

Table 3.14 Load and concentration of pollutants in exhaust gases from vehicles during construction phase

No	Parameters	values (g/s)	Concentration (mg/m ³)	QCVN 19:2009/BTNMT, column B, Kv = 1,2; Kp = 1,0
1	dust	0,112	29,6 - 32,3	240
2	SO ₂	0,0016	0,4 - 0,5	600
3	NO _x	1,511	400,8 - 437,3	1020
4	CO	0,344	91,3 - 99,5	1200
5	VOC	0,124	33,0 - 36,0	-

Source: Assessment of Sources of Air, Water and Land Pollution, WHO, 1993

Note:

- Load (g / s) = [Pollution factor (kg of pollutant / ton of oil) x Oil consumption (kg / h)] / 3,600.
- - Concentration (mg / Nm³) = [Load (g / s) / Flow (m³ / s)] x 1,000.
- - QCVN 19: 2009 / BTNMT, column B; Kp = 1.0; Kv = 0.8:
- National technical regulation on industrial emissions for dusts and inorganic substances; column B applies to operating establishments as from January 16, 2007; The discharge flow coefficient Kp = 1.0 corresponds to the total exhaust gas flow rate of the chimneys and exhaust pipes of the facility: $P \leq 20,000$ m³/h; Area coefficient Kv = 1.2 for rural areas.

The results show that the load, concentration of pollutants is not large. This type of pollution is usually not large due to dispersion in large, open environment. As a result, the area surrounding the project site is negligible.

Comment:

The above results show that the concentration of pollutants arising from the operation of the construction equipment has reached the allowable level

under the Standard No. QCVN 19: 2009/BTNMT (column B, $K_p = 1$; $K_v = 1,2$).

In addition, the calculation assumes that the source of pollution is the point source. In fact, the inactive machinery is concentrated at the same time and the construction area is quite open, the concentration of pollutants generated in reality will be much lower than calculated.

However, these gases will also degrade the quality of the air environment and directly affect the construction workers, so the Employer also takes specific measures to minimize this impact.

☞ Emissions from pile driving

As stated in the project implementation methodology, the Employer chooses the pile pressure scheme based on the geological structure in the area and the advantages of the piling method.

During pile driving, the main source of air pollution is from the use of DO fuel to operate the equipment. However, the project has grid power to serve the construction, so the contractor will not use equipment that uses DO, so will limit the source of this pollution. Besides, the piling method used also has the following advantages:

- Gentle, insignificantly noisy
- Limiting shocks to neighboring buildings
- Better quality inspection: each pile is pressed under pressure and the load capacity of the pile is determined by the final pressure.

☞ *Exhaust emissions from mechanical operations:*

In the process of welding the steel structure, the chemicals in the welding rod are burned and emitted smoke containing toxic substances, potentially polluting the air environment and affecting the health of workers. The concentration of toxic gases in the welding of metallic materials is summarized in the table below:

Table 3.15 The concentration of toxic gases in the welding process of metallic materials

Pollutant	Welding rod diameter				
	2,5	3,25	4	5	6
Welding smoke (containing other pollutants) (mg /1 welding	285	508	706	1.100	1.578

Pollutant	Welding rod diameter				
	2,5	3,25	4	5	6
rod)					
CO (mg /1 welding rod)	10	15	25	35	50
NOx (1 mg of solder)	12	20	30	45	70

Source: Pham Ngoc Dang, Air Environment, Science and Technology Publishing company, 2000

The discharge load from the welding process is not expected to be high compared to other sources of pollution but will directly affect the welders. With appropriate personal protective equipment, the adverse effects on workers are limited.

In addition, the process of cleaning the surface of the silicon also generates emissions that contain metal oxides such as Fe₂O₃, SiO₂, K₂O ..., other slag and other debris will be released into the environment plus solvent vapors. Occurs during the coating of equipment will pollute the air and particularly affect the workers working in the area. However, this amount of gas is not much and this work is only done during construction so the impact is local and only temporary..

(3) Impact on water environment

In the construction phase, waste water sources including:

- Domestic waste water from the activities of construction workers
- rain water flows.
- Waste water comes from sanitation equipment, car wash, concrete mixing area.

☒ Domestic waste water:

- *Source: mainly due to the activities of construction workers.*

- *Flow:*

- +The maximum number of workers in the construction process of the project is estimated at 500-600 people, of which about 10 people are staying at the construction site at night.

- +Average daily water consumption per worker according to Guideline 20 TCXDVN 33: 2006 is 45 liters/person/shift and the daily water consumption of each worker is about 60-80 liters per person per day.

+The amount of water needed for construction workers at the time of highest concentration is:

+ $[500-600 \text{ (people)} \times 45 \text{ (liter / person / shift)} \times 1 \text{ shift / day} \times 2.5] + [10 \text{ (people)} \times (80 \text{ liters / person / day})] = 27.8 - 33.2 \text{ m}^3 / \text{day}$

+Flow rate of wastewater: about 27.8 - 33.2 m³/day (estimated amount of wastewater is equal to 100% of water supply).

• *Load, concentration:*

The amount and concentration of pollutants present in the wastewater are shown in the following table:

Table 3.16 Load and concentration of pollutants in domestic wastewater during construction phase

No	parameters	unit	Medium concentration (*)	Values (kg/date)	QCVN 14:2008/BTNMT Viet Nam standard (column B, K=1,0)
1	pH	-	6,8	-	5 ÷ 9
2	TSS	mg/l	220	2,83	100
3	COD	mg/l	500	6,42	--
4	BOD ₅	mg/l	250	3,21	50
5	N _{total}	mg/l	40	0,51	--
6	P _{total}	mg/l	8	0,10	--
7	Coliform	MNP/100 ml	10⁶ – 10⁹	-	5.000

Note:

- (*):Source: Tran Van Nhan and Ngo Thi Nga, Waste water treatment technology curriculum, Science and Technology Publishing House, 1999..
- Parameters in bold: higher than standard.
- Load (kg/day) = Concentration (mg/l) x Flow (m³/day)/1.000
- QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater. Column B permits in domestic waste water discharged into

water sources used for domestic water supply; Coefficient K = 1.0 corresponding to a scale of less than 500 persons.

– --: Not regulated.

Remark:

Comparison of concentration of some substances in domestic wastewater with standard QCVN 14:2008/BTNMT (Column B, K=1,0) showing that:

PH indicator meets regulatory standards;

Target SS, BOD5, Coliform higher than standard regulation;

And the norm COD, N_{tổng}, P_{tổng} not regulated.

Therefore, if this waste water is not treated, direct discharges into the receiving water sources will pollute the water sources in the area.

☞ **Rain water flows:**

• *Sources:*

As a rule, rain water is conventionally designated as clean water if it is not exposed to pollutants such as sewage, pollutants, contaminated soil. Contaminating components to the source, facilitating the rapid spread of pollutants.

During the construction process, if the sources of pollution are not controlled as regulated, when the rain falls to the project site, it will remove the pollutants in the waste gas, wastewater and CTR. Receiving source pollution.

Depending on the local rainfed control scheme, the composition and concentration of rain water vary considerably.

• *Flow:*

Calculate rainfall flow: Refer to standard TCVN 7957: 2008 and TCXDVN 51: 2008 (*) Drainage, external networks and structures, design standards. The maximum rainfall from the project area is estimated as follows:

$$Q = q \times C_1 \times F / 1000 \text{ (m}^3\text{/s)} \quad (*)$$

Of which:

-
Q: Maximum flow of runoff. - q: rain intensity calculated, $q = A (1 + C_2 * \lg P) / (t + b) n$ ♣ t: Rain flow time (minutes), choose t = 180 minutes ♣ P: Cycle repeat rainfall calculation (years), choose P = 5 years ♣ A, C₂, b, n: The parameters determined according to the local rain conditions (the neighborhood is Bao Loc: A = 11.100, C₂ = 0.58, b = 30, n = 0, 95); Instead we have: q = 98 (l / s.ha)

- C_1 : The flow coefficient depends on the surface properties of the basin and the recurrent rainfall cycle P

- F: Area of the project land 127,5ha

- $C_1=0,3$ (for the ground: $C_1 =0,3$)

→ So, $Q = 98 \times 0,3 \times 127,5/1000 = 3,75 \text{ m}^3/\text{s}$

• Composition, concentration, loading:

Table 3.17 Concentration, loading of pollutants in stormwater runoff during construction phase

No	Pollution parameters	Value (mg/l)
1	Total Nitro	0,5 ÷ 1,5
2	Total Phospho	0,004 ÷ 0,03
3	COD	10 ÷ 20
4	total suspended solids	30 ÷ 50

Source: Hoàng Huệ, Giáo trình cấp thoát nước, năm 1997

☞ **Waste water:**

• Stationary sources:

• Mainly arising from the washing of construction equipment, transport vehicles before leaving the site.

• Ingredient:

• Construction wastewater contains suspended solids, grease. This amount of wastewater is not high and infrequent, if well managed, does not significantly affect the water environment in the area.

• Flow:

• Calculating the total number of vehicles entering and exiting the project during the construction phase of the project is 2 vehicles per day, according to TCVN 4513: 1988: Internal water supply - design standards; It is estimated that the amount of washing water is 300 liters/car, so the maximum amount of wastewater is 6m³/day.

• Impact:

• Impact of suspended solids:

• The suspended solids released into the water will float on the surface of the water to form a thick layer, gradually turning gray, not only to lose

sight of the beauty, but more importantly, oxygen exchange and light transmission, leading to anaerobic conditions. On the other hand, some of the bottom sediment will decompose under anaerobic conditions, which will create bad odor to the surrounding area. Suspended solids will reduce photosynthesis and reduce the growth and development of plants in the water.

- Impacts from grease:

- When discharged into the water, most of the oil spills quickly on the surface of the water to form an oil film, leaving only a small amount of water. Sediment containing oil deposited in the river will be decomposed, partially floating on the water surface, partly soluble in water and the remainder deposited in the mud, polluting the aquatic organisms and affecting the surface water. area.

(3) Impact of solid waste

**** Waste from the construction process:***

- Most of the waste is scattered in the process of construction such as soil, brick, cement, steel scrap The amount of waste generated depends on the characteristics of the project and its management. This part of the CTR does not have a significant impact on human health, but causes a loss of the landscape.

- For garbage from the construction process, it will obstruct workers' travel, debris, and iron debris that can cause occupational accidents, packages that break down for long periods when they are not. Thorough collection will bury the soil causing soil pollution.

**** Hazardous waste:***

- In the process of construction, there will be some hazardous waste such as tar oil and tar oil drums for traffic works, mops, paint buckets, paint brushes, waterproofing substances, light bulbs, grease and waste. This is also a source of pollution that should be collected and treated properly.

- The amount of HW generated during construction is estimated at a maximum of 10 ÷ 20 kg/month.

**** Household waste:***

- On average, the amount of solid waste generated per capita at the construction site is 0.5 kg/day. Therefore, with the number of people involved in the construction site at the peak of 500-600 people, the amount of domestic waste estimated at 250-300 kg/day.

- For living CTR if not properly managed, collected, organic wastes will decay creating odors, causing environmental pollution, creating conditions for disease.

- In addition, CTR can be polluted by rainwater or blocked by flow. Leachable water can contaminate soil and contaminate soil and groundwater.

Impact on soil environment

The soil environment will be affected by three sources: waste water, waste gas, solid waste. If contaminated water flows through it, the land where the water flows will be polluted, emissions and dust are released in the air, absorbing water vapor and becoming heavier than air, falling back to the surface and affecting the quality of the soil environment. In addition, solid waste of workers working on the site is also a source of environmental pollution if not collected and treated properly.

3.1.2.2 Source of impact not related to waste

*** Noise, vibration**

- Source: noise, vibration arising from:
- Vehicles transporting equipment, construction materials to the project.

Activities to strengthen the foundation, piling, construction of construction items.

- Besides the pollution caused by construction activities, the operation of construction equipment and tools such as excavators, drilling machines, rollers, trucks, welding and cutting machines also cause significant noise and vibration.

- Noise level: Refer to the noise level of the construction equipment when measured at a distance of 1.5 m from the source as shown in the following table:

Table 3.18 Noise level of construction equipment during project construction

Equipments	Noise (dBA), distance 1,5 m		QCVN 24:2016/BYT Viet Nam standard
	document (1)	document (2)	
Bulldozers	93,0	-	85
Compaction machine	-	72,0 ÷ 74,0	
Front shovel excavators	79	72,0 – 84,0	

Equipments	Noise (dBA), distance 1,5 m		QCVN 24:2016/BYT Viet Nam standard
	document (1)	document (2)	
Tractor	-	77,0 ÷ 96,0	
Truck	-	82,0 ÷ 94,0	
Concrete compactors	85,0	-	
Crane	-	76,0 ÷ 87,0	
Scraper, leveling machine	-	80,0 ÷ 93,0	
Generator	82,5	72,0 – 82,5	
Spreader	-	87,0 ÷ 88,5	
Compressor	80,0	75,0 ÷ 87,0	
Pile presses	75,0	95,0 ÷ 106,0	
Welding, cutting	84,0	-	

Source: Materials (1): Nguyen Dinh Tuan et al., 2002; Documentary (2): Mackernize, 1985

Note:

- - Parameters in bold: higher than standard.
- - QCVN 24: 2016/BYT: National Technical Standards for noise - exposure levels allow noise in the workplace.

• *Impact:*

Noise, vibration directly affects construction workers on the site, causing damage to parts of the human body, especially for workers working in high-noise areas. In addition, noise can drown out the necessary signals, which can endanger construction workers on the site. Firstly, the auditory organs are directly affected by noise, which reduces the sensitivity of the ear, hearing loss, and causes deafness. In addition, noise causes headaches, ringing in the ears, dizziness, nausea, neurological disorders, cardiovascular disorders and digestive system diseases. Vibration causes neurological, cardiovascular and joint diseases.

□ Heat

- Source: heat generated during the construction process by the use of heating equipment (boiling, asphalt spreading ...) and from the solar radiation due to long time working in the sun during construction project construction.

- Thermal impact: the effects of heat from solar radiation caused by long-term exposure to sunlight will make workers fatigue, thirst, headache, dizziness. This leads to a decrease in labor productivity and a higher likelihood of accidents.

□ Socio-economic impact

- Positive impact:

+ Contributing to solving labor and increasing temporary income for laborers.

+ Stimulating the development of some types of services such as: renting houses, eating and drinking and other entertainment services to serve the daily needs of workers in the project area.

- Negative impact:

+ Impact on security and social order:

The concentration of workers in the project area during the construction period (around 500-600 workers) will cause social insecurity and increase social evils in the area if workers' awareness is low. Not well managed. However, these are the effects that can be completely controlled.

The concentration of relatively large construction workers can increase the pressure on local social management, regional security and disorder. In addition, it increases the probability of spreading the disease by transmission. These are likely impacts if there are no precautionary measures and isolation measures. However, the workers working in the project are mainly local people so the impact is negligible.

The construction process will increase the density of vehicles on the road and will lead to an increase in the likelihood of traffic accidents. In addition, the frequent entry and exit of vehicles will cause certain obstacles to the traffic. Therefore, this transportation will have a certain impact on the lives of people living along the transport routes is inevitable.

□ Impact on traffic

- Impact on the traffic situation in the area due to the increase in the density of means of transportation participating on the road around the project: transportation of building materials, equipment and vehicles of workers.

- During the construction process will increase the traffic density of the area, according to the estimated volume of transport vehicles building materials, in the project area on an average of about 4 trips, in addition to the means of transport of public human. Therefore, the circulation of these vehicles will affect the traffic in the area to a greater extent: increased traffic density and traffic accidents on the above roads if not paid attention and resolution. appropriately.

At present, these roads have been concreted and the road surface is flat so they can be loaded and transported during the construction period.

3.1.3. Evaluating and forecasting impacts during the project activities

- Operation stage includes the following activities:
- Concentration of staff to operate.
- Power transmission activities of the plant and the connection line.
- Maintenance and maintenance of power plants, inverter stations, transformer stations and connection lines.

Objects and scales affected during the operation phase are presented as follows:

Table 3. 19 Objects and scales are affected during the operation phase

NO.	Impacted object	Impacted scale
1	Air environment	Direct impact on the air inside the project and the surrounding area due to the influence of the wind and the propagation process.
2	Water Environment	- Receiving waste water from the factory and all rain water spills over the project area.
3	Earth environment	- Land environment in the project area due to wastewater, exhaust gases containing pollutants, sedimentation or landfill discharge..
4	Socioeconomic	- Contribute to landscape architecture and technical infrastructure development in Hong Phong commune, Bac Binh district. - Bring socio-economic efficiency to the local.
5	Human	Employees working in factories, operators, maintenance, and the surrounding area

Table 3.20 Main pollution problems and sources arising during the project operation phase

Main pollutants	Origin of arise
<i>Air pollution</i>	
SO ₂ , NO ₂ , CO, VOC, bụi...	- From the operation of the means of transport to and from the project
NH ₃ , H ₂ S, CH ₄ ,...	- From the drainage system - From storage area CTR

Main pollutants	Origin of arise
Noise, vibration, heat	- Activities of means of transport - Operation of the transformer
Pollution water	
Rain water	Rainwater flows in the area
Domestic wastewater (BOD, COD, TSS, Ammonium, Coliform, animal and vegetable grease ...)	- In the course of the life of employees in the factory
Pollution by solid waste	
Domestic waste Non-hazardous waste Hazardous waste	- During the operation of the plant
Electromagnetic field (impact on human health)	- Operation of the transformer station
Incidents (labor accidents, fire, electrical disruptions, etc.)	- In the course of operation, maintenance and maintenance of safety corridors

3.1.3.1. Sources related to waste

(1) Impact on the air environment

** Dust and emissions from the operation of means of transport*

During the operation of Hong Phong 1A power plant, only electricity transmission to national grid, no demand for raw materials and no production of products, so no activities transporting materials and products. Thus, during this period, emissions emanate primarily from the means of transport employed by workers entering and leaving the factory.

The means of transport into and out of the area are mainly motorbikes and cars. The fuel used by these vehicles is gasoline and diesel which emits a dust, NO_x, SO₂, CO, VOC emissions, etc. These components depend on the concentration of each type of impact. on the environment and human health in different ways.

Table 3.21 Coefficient of pollution from vehicles

No	Emissions	Pollution Factor	
		Car (g/km)	motorbike (g/km)

No	Emissions	Pollution Factor	
		Car (g/km)	motorbike (g/km)
01	Dust	0,12	-
02	SO ₂	0,6S	0,76S
03	NO _x	0,08	0,3
04	CO	22	20
05	VOC	12	3

Source: Assessment of Sources of Air, Water, and Land Pollution – WHO, năm 1993

Note: S: Sulfur content in gasoline is 0,05% (Source: Petrolimex, năm 2015)

☒ **Mùi:**

Sources: Odor arising from the following sources:

- From the waste water collection and drainage system of the project.
- From garbage containers, garbage area.

Ingredient:

- - Odor arising from the collection system, waste water drainage when leaking. In this case, there will be an amount of gas released into the environment causing odors. The components of these gas vapors are mainly NH₃, H₂S ... However, the waste water collection system of the project is built closed and underground, so the smell is incurred.
- - In the process of storage (waiting for collection), the waste from the factory will generate unpleasant odors from the decomposition of organic matter. Typically, CTR will begin to decompose after one day of storage (in garbage containers, garbage storage areas).

(2) Impact on water environment

☐ **Rainwater overflow:**

As a rule, rain water is conventionally designated as clean water if it is not exposed to pollutants such as sewage, pollutants, contaminated soil. Contaminating components to the source, facilitating the rapid spread of pollutants.

In the course of project operation, if the sources of environmental pollution are not controlled as regulated, when the rain falls into the project land, it will be washed with pollutants in waste gas, waste water and CTR. pollution. Depending on the local rainfed control scheme, the composition and concentration of rain water vary considerably.

All rainwater will be diverted to the rubbish and deposited in the manholes before the source is taken.

□ **Wastewater:**

Source of wastewater: Domestic waste water is generated from the activities of employees working in the factory.

Water: Wastewater generated from the project is about 9,225 m³/day as estimated in Chapter 1.

Load, concentration: The amount and concentrations of pollutants present in this wastewater are shown in the following table:

Table 3.22 Load and concentration of pollutants in domestic wastewater during the project operation phase

No	Parameter	unit	Concentration medium (*)	Quantity (kg/ngày)	Viet Nam standard 14:2008/BTNMT (column A, K=1)
01	pH	-	6,8	-	5 ÷ 9
02	TSS	mg/l	220	192	120
03	COD	mg/l	500	436	--
04	BOD ₅	mg/l	250	218	60
05	N _{total}	mg/l	40	35	--
06	P _{total}	mg/l	8	6,97	--
07	Coliform	MNP/100 ml	10⁶ – 10⁹	-	3.000

Note:

- (*):Source: Tran Van Nhan and Ngo Thi Nga, Waste water treatment technology curriculum, Science and Technology Publishing House, 1999.
- - Parameters in bold: higher than standard.
- Load (kg/day) = Concentration (mg/l) x Flow (m³/day)/1.000.
- QCVN 14:2008/BTNMT: National technical regulation on domestic wastewater. Column B allowed in domestic wastewater discharged into water sources not used for domestic water supply; coefficient K = 1.2 corresponding to the number of people <500 people.
- --: not regulated.

Remark:

Comparison of concentration of some substances in domestic wastewater with standard QCVN 14:2008/BTNMT (column B, K=1) showing that:

- PH indicator meets regulatory standards;;
- Targets TSS, BOD₅, Coliform is higher than regulation;
- And the norm COD, N_{tổng}, P_{tổng} not regulated.

(3) Impacts of solid waste

The wastes generated during the operation phase are mainly composed of::

➤ *Domestic waste:*

Derived from the activities of employees working in the factory. With the expected number of employees of the factory is 82 people, according to QCVN 01: 2008 / BXD regulations, each person discharge on average 1.0 - 1.2 kg. As a result, the volume of domestic solid waste generated is estimated at 82 - 98.4 kg / day.

Domestic solid waste has a high organic content, which is easily decomposed and causes odors. In the composition of solid waste daily activities are very difficult to decompose should be a source of long-term pollution to the soil environment as plastic wrap, plastic.

The composition of domestic waste is summarized and presented in the following table:

Table 3. 23 Composition of domestic solid waste

No	Ingredient	ratio (%)	
		Oscillate range	Medium
01	Food	61,0 – 96,6	79,17
02	Paper	1,0 – 19,7	5,18
03	Carton	0 – 4,6	0,18
04	Nilon	0 – 36,6	6,84
05	Plastic	0 – 10,8	2,05
06	Fabric	0 – 14,2	0,98
07	Wood	0 – 7,2	0,66
08	Hard rubber	0 – 2,8	0,13
09	Glass	0 – 25,0	1,94
10	Cans of canned goods	0 – 10,2	1,05
11	Non-ferrous metals	0 – 3,3	0,36
12	Porcelain	0 – 10,5	0,74
13	Debris	0 – 9,3	0,69
14	Styrofoam	0 – 1,3	0,12
Total			100

Source: Trung tâm Centema, 2007.

➤ *Hazardous waste:*

Derived from the operation of the plant such as batteries, fluorescent lamps, waste arising from the maintenance and repair of equipment such as waste oil, oil mop, oil transformers, paint tanks. , sticky paint stick, ...

+ Oil MBA (Insulation Oil MBA) used

Cooling and Insulation MBA requirements ensure some of the following requirements or equivalents:

Insulating oils will be Shell, Diala, Nynas, Caltex or equivalent.

+ Characteristics: Insulating Oil MBA is new, in accordance with IEC 60296 - grade II. Kinematic viscosity does not exceed 9.0 mm²/s at 40 ° C, dielectric dissipation factors at 100 ° C do not exceed 0.01%. The insulating oil used for all transformers in the substation is of the same oil manufacturer.

Transformer oil is a non-PCB containing oil.

- The volume of MBA oil of a machine is 27.4 tons; Density 890 kg/m³.

- According to operation regulation, when checking that the quality of MBA oil is not up to specifications, refine and supplement; If the quality of MBA oil after filtering is changed to new oil. When replacing a new MBA or an MBA accident (leakage, risk of fire or explosion), all of the engine oil is withdrawn to the oil tank.

- With the oil package MBA (under 600kg) will contract with the unit has the function of collecting and processing according to regulations.

- Battery system: After use, the battery will be collected and contracted with the unit responsible for treatment of hazardous waste for treatment according to regulations.

+ Oil, grease, paint bunkers, paint-sprayed objects, waste oil, other periodic maintenance

The periodic maintenance and repair of the transformer station will generate cleaning rags with oil and grease. Volume depends on the volume of machinery, equipment to clean, maintenance. Normally, this volume of waste

about 4 kg/month will be contracted with the unit has the function of collecting and processing according to regulations.

+ Replacement batteries in the maintenance process, periodic maintenance

Solar cells have a very large battery life, about 25 years, normal operation does not cause pollution, however, during the battery life cycle, some batteries may be damaged and replaced. Investors will contract with units that have the function of collecting and processing according to regulations.

There are also other waste arising during the maintenance, repair such as porcelain, wire, damaged

3.1.3.2 Source of impact not related to waste

Impact of electric field on operator and neighboring areas

An electromagnetic field is a special form of matter, characterized by a combination of electrical and magnetic properties. The basic parameters, which represent the characteristics of the electromagnetic field are: frequency, wave length and propagation speed.

As it is known around the conductor, a device with an electric current flowing at the same time has an electric field and a magnetic field. For DC currents, these fields are not interdependent, and for AC current they are closely related and form a uniform electromagnetic field.

Around the current carrying device will arise from the concentric field. The amplitude of the magnetic field is proportional to the current amplitude and inversely proportional to the distance from the charged object.

The negative impact of electromagnetic field currents on the industrial frequency is shown only at the magnetic field strength of $150 \div 200$ A/m, so the risk assessment of the electromagnetic field of high power This is done mainly by electric field strength.

During the operation of the plant, there will be electromagnetic fields from the equipment and high-voltage power lines such as transformers, power lines. The plant uses 22/220 Kv-125MBA transformers and 22/0.4 Kv-250kVA, around the MBA will form an electric field. In transformer stations, the average electric field strength varies from 5 to 25 kV/m, the highest in the

capacitor area is 45 kV/m, the average magnetic field strength is 1-5mT, the highest is 14mT Low pressure bar with large current.

Under the power transmission line: At low deflection points crossing roads, the electric field can reach 20-25 kV/m, 3-18mT magnetic field; Inside the house is 10-30 m from the line, the electric field does not exceed 0.5 kV/m, while the yard is from 0.7 to 3 kV/m.

According to the requirements of Decree 14/2014/ND-CP, Article 7 - Electric field strength in areas where regular working people are required must not exceed 5 kV/m and Article 9 - The distance from the lowest point of the power transmission line in the sag condition to the ground shall not be less than 18m for the voltage of 220kV.

According to QCVN 25: 2016/BYT - National Technical Regulation on Electromagnetic Field Frequency Industries - Contact Levels allow Electromagnetic Field Frequency Industries at Work:

Table 3. 24 Contact level with electric field at work

Electric field strength E (kV/m)	<5	5 ≤ E ≤ 20	20 < E < 25	≥ 25
Exposure time allowed (Phút)	Unlimited	(50/E-2).60	10	Not touch

Effect of electromagnetic field on the human body:

When they have to live or work in long term in the area of influence of electromagnetic fields in excess of the allowable limit, their health is impaired with tired, uncomfortable, drowsy symptoms, even more serious i.e. dysfunction of the central nervous system, the cardiovascular system, causing headache, throbbing pain in the heart region, increased fatigue and blood pressure, arrhythmias.

Recognizing the magnitude of the impact of electromagnetic fields on human health, the project owner will fully comply with current regulations on electrical safety and appropriate measures right in the design and construction stage as well as the operation of the facility to minimize impacts below the allowable limit so as not to affect people.

✎ Impact caused by battery panel installation

The structure of the battery is photovoltaic cells located in the middle of the two layers of glass so the phenomenon of photovoltaic cells is almost

not existed. In the event of a break, the power will immediately be detected or the workers shall check daily for timely detection and replacement.

During the operation, the system has been fixed surely to prevent from falling and losing accessories.

3.1.4. Evaluating, forecasting the impacts caused by the risks and incidents of the project

3.1.4.1. During the preparation and construction phase of the project

Incidents may occur during the project preparation phase as follows:

✎ Labor accidents

Labor safety is specially interested by construction contractor to direct workers on the construction site:

- Environmental pollution is likely to adversely affect the health of workers on the site. Some of the contamination depends on the time and intensity of the exposure, which can have a severe effect on the worker, cause dizziness, fatigue, even fainting and urgent medical attention (usually for women workers or people with weak health).
- A noteworthy feature of luminescence is reptiles, insects such as snakes, ants, scorpions, poisonous mosquitoes, etc. In the performance, workers must pay attention to this issue because all carelessness will lead to many unforeseen consequences, affecting the health and life of workers.
- The means of transportation getting in / out of the construction site may lead to accidents.
- Labor accidents from access to electricity, such as the power supply system, collisions with electric lines crossing the roads, storms and winds to break the electrical wires.
- At the construction site during rainy days, the potential for occupational accidents can be high: slippery soil leads to slippage for workers, electric problems are more likely to occur, soft soil and sinking will cause incidents for people and construction machinery and equipment ...
- The use of heaters in construction (boiling, asphalt, welding ...) can cause fire, burns or occupational accidents if there is no preventive measure.

✎ Explosion and fire incidents

- Fuel sources (such as DO) that are often contained within the site are an important source of fire, especially when these warehouses (or yards) are placed near the heaters.

- Another cause of fire or explosion may be generated from electrical faults.

When the incident happens, it can lead to serious socio-economic damage and seriously pollute the air and soil environment. It also affects human lives and property.

✎ Failure of the equipment, traffic accident

During this period, the area of the project will focus on machinery, equipment and vehicles entering the regular area. Therefore, accidents occur if the construction equipment is improperly damaged or the equipment is operated with incorrect capacity.

In addition, if the transportation of raw materials, construction materials and equipment into the construction site disobeys with the regulations, it is very likely to cause traffic accidents, damage to people and property.

✎ Environmental problems

- Incidents caused by mobile toilets: Construction will generate significant amounts of wastewater from the operation of workers on the site. If mobile toilets are inefficient or overloaded, they will pollute the environment.
- Incident of the location of temporary waste: rainwater swept through waste, causing flow congestion and environmental pollution.

3.1.4.2. During the project phase

In the process of project operation, despite the application of many preventive measures, there are likely to occur environmental risks and incidents to cause great damage to people and property of the people and strongly affect the environmental compositions in the region and surrounding area.

✎ Incidents of Explosion, electric shock

This incident occurs during the operation phase, at locations of the substation and the connection line. The main reason is that workers do not comply with regulations and the people are not aware of the problem of safety of high voltage grid,...

+ *Electric shock*: when the operator does not strictly comply with the safety rules in operating and using electrical equipment, electric shock may occur. The magnitude of this incident is limited to the spot, directly to the worker causing the incident. When there is a problem, the protection circuit relay of the circuit breaker.

+ *Fire explosion*: A fire or explosion may occur during short-circuiting or overloading, lightning strike or breakage, especially at cross-site with

other power lines. Power failure occurs only in situ and in short time, because when the protection relay is located at the circuit breaker, the automatic fire protection system will be activated automatically. However, fire and explosion can cause fire, if not timely extinguish the fire, it may lead to the risk of fire spreading.

The above incidents are rare due to correctly following the standards and proper operation of the workers who are trained in term of safety measures in the design process.

☞ ***Incidents of fire and explosion, oil spill of the transformers***

- Some of the major causes are identified and listed as potential fire hazards during the operation of the transformers as follows:
- Fire caused by short circuit, power shocks;
- Fire caused by poor wiring (losing, open);
- Fire due to static electricity such as lightning strike or break of wires;
- Transformer-related incidents are caused by internal and external causes of the transformers; the probability of the transformers fire is very low;
- The transformers explosion causes a large amount of cooling oil to leak into the environment. If there is no collection measure, the transformers’ oil spilling into the environment will pollute the environmental components, especially the soil and water environment, negatively affecting the habitat of species, the ecosystem, and influencing the living of people in the project area. However, the transformer station has designed the system to collect oil in the oil trap to minimize this effect.

☞ ***Lightning strike***

- Extremely high currents of lightning may cause breakage, damage to the line and possibly explosion of the transformers. However, to ensure the safety of the grid, the transformer is installed the lightning protection system. Direct lightning protection in the transformer with lightning rods (3 meters) mounted on a single-pole centrifugal concrete pole and designed to hang two lightning conductors across the line of connection.
- The work is designed with the Vietnamese lightning protection standard so it is difficult to occur the lightning strike. On the other hand, it is possible that the equipment is damaged by time or by weather

conditions, when problems can occur. Therefore, it is necessary to pay attention to regular inspection and tests after flood or heavy rain.

☞ **Natural disasters (thunderstorms, floods, etc)**

- The battery rack system is a fixed, non-rotating system with inclined angle, mechanical movement components and no rotary capacity subject to the sun's orbit. Therefore, flood does not affect the battery system of the project.

The probability of occurrence of the incident depends on the sense of observance of the rules and safety rules of employees on a case-by-case basis. Therefore, the owner should be equipped with safety knowledge and raise the sense of responsibility for employees, to limit the potential risks.

3.2. COMMENTS ON THE DETAILS, RELIABILITY OF EVALUATION AND ANTICIPATION RESULTS

The reliability of these estimates and forecasts is generalized in the following table:

Table 3.25 Generalized reliability evaluation of the EIA

No.	Assessments of environmental impacts, risks of environmental incidents	Level of detail, reliability	Causes
A. Stage of project preparation and construction			
<i>a. Waste-related impacts</i>			
1	Impact on the air environment	Mean	- There is no detailed data on the operating time of equipment for construction - Theoretical calculations based on the pollution coefficient set by the World Health Organization (WHO)
2	Impact on water environment	High	- - It is possible to estimate sources of water pollution - Reference to the curriculum has been evaluated and verified to be highly reliable
3	Impacts of solid waste	High	- It is possible to estimate the types of waste and estimate the

No.	Assessments of environmental impacts, risks of environmental incidents	Level of detail, reliability	Causes
			volume to be generated - The actual references of the works under construction
<i>b. Non waste- related impacts</i>			
1	Noise, vibration, traffic situation, social order and safety, impact on neighboring areas, etc,...	Mean	- There are no detailed data on the time and volume of construction items - The level of noise and vibration generated in the vibration range should be relatively reliable. - The likelihood of such adverse effects depends on the management and implementation measures of the investor and the construction contractor.
<i>c. Incidents, environmental risks</i>			
1	Labor accidents, fire, explosion, flood, settlement of the river banks, etc	High	- Practical references have occurred in some works
B. The Project’s getting into operation			
<i>Waste-related impact</i>			
1	Impact on the air environment	Mean	- It is possible to estimate sources of air pollution - Limited evaluation due to lack of detailed data
2	Impact on water environment	High	- From the scale of the project activity, it is possible to estimate the amount of wastewater generated and the impacts that may affect the water and soil environment. - Actual references of projects

No.	Assessments of environmental impacts, risks of environmental incidents	Level of detail, reliability	Causes
			that have been put into operation
3	Impacts of solid waste	Mean	<ul style="list-style-type: none"> - It is possible to estimate the sources of waste and the amount of waste generated - Limited evaluation due to lack of detailed data
<i>Non waste- related impacts</i>			
1	Noise, socio-economic impact, traffic situation, cross-impact with surrounding works ...	Mean	<ul style="list-style-type: none"> - The assessment is general theory. - The likelihood of these adverse effects depends on the management and the measures taken by the investor.
<i>Incidents, environmental risks</i>			
1	Incident in electricity, fire, labor safety	Mean	<ul style="list-style-type: none"> - Practical reference has occurred in some projects - Due to technical limitations, not all possible problems can be assessed.

CHAPTER 4

MEASURES FOR PREVENTING, REDUCING NEGATIVE IMPACTS AND PREVENTION, RISK RESPONSES AND INCIDENTS OF THE PROJECT

4.1. MEASURES FOR PREVENTING, REDUCING NEGATIVE IMPACTS OF THE PROJECT

4.1.1. Measures for preventing, reducing negative impacts of the Project in the stage of preparation for construction

4.1.1.1 Measures for preventing, reducing negative impacts related to waste

To minimize pollution caused by luminescence and leveling, the Employer shall take the following measures:

(1) To minimize impact on the air environment

- For dust arising during the liberation and leveling phase, which directly affects the workers working in the project. Therefore, the Employer should equip the workers with masks and labor protection to prevent the workers from lung diseases.

- To limit air pollution on transport routes by strictly inspecting and checking the means of transportation. During transportation, trucks will be covered with tarpaulin, avoiding shreds on the way of transportation.

- To make planning and execute reasonable and sequential human resources, to avoid overlap between the construction stages: to clear the ground, leveling.

- To make gradually sand leveling after dropping to reduce the diffusion of the leveling material due to wind effect.

- To limit traffic congestion by concentrating on trucks at the same time by coordinating transportation operations in a reasonable manner.

- For trucks transporting ground leveling: The truck transporting material should have canvas covering the upper material to minimize the impact of dust diffusion, avoid spreading on the transport.

(2) To minimize impact on water environment

☞ Domestic waste water

The amount of domestic wastewater in the stage of clearing and leveling is about 5,625m³/day, corresponding to the number of workers 50 people in this period, the Employer will arrange about 03 toilets. Toilet is

made of composite material, size: length: 90 cm x width: 130 cm x height: 242 cm; about 2,8 m³.

Periodically, wastewater and faeces from mobile toilets shall be transferred to functional units for removal to other places in accordance with regulations.

(3) To minimize impact due to solid waste

✎ Photoluminescent biomass

+ Plant biomass (mainly acacia, eucalyptus and wild weeds) will be cleared and cleaned before construction, the volume of biomass of the project will be collected at a convenient location in the project area and contracted with the unit to collect and transport to the designated place.

✎ Domestic waste:

The amount of domestic waste generated by the workforce at this stage is estimated at about 25kg/day to be collected by local authorities. To facilitate the management and collection of some of the proposed control measures:

- To create site rules that require workers not to litter indiscriminately;
- Small amount of household waste will be collected in 25-liter containers, which are located in the areas to facilitate disposal. The total number of boxes required for investment is 04 25L barrels.

4.1.1.2 To minimize non-waste related impacts

✎ To minimize noise during clearance and leveling

The noise generated during clearance and leveling is mainly due to the means of transportation of waste and leveling materials, but this period is only done in a short time and the leveling operation only affects project area. In order to minimize the impact of noise, the project will arrange for idle transport facilities during peak hours, and have reasonable transportation plans that do not overlap trucks as well as trucks mobilized concurrently.

✎ To minimize traffic accidents

For trucks:

- To organize timely transportation of waste, to avoid peak hours
- Vehicles must have cover or cover canvas to avoid falling on the road to affect the travel of people on the road.

✎ Measures to reduce flood in the leveling process

To minimize the flood possibility in the leveling process, the Employer shall take the following measures:

- To create a water drainage around the area to the existing canal before leveling: to make a temporary drainage ditch. In case of rain, rain water will be discharged to the receiving source.

- To ensure the leveling according to the planning and the drainage slope according to the design.

4.1.2. Measures to prevent and mitigate negative impacts of the project in the construction stage

4.1.2.1 Measures to prevent and mitigate waste- related impacts

In order to minimize negative impacts during the construction phase of the project, the Employer shall take the following measures:

- To require the contractor for the construction of the project to commit to apply measures to control environmental pollution described in the following items.

- To strictly supervise compliance with these requirements in accordance with current law.

(1) To minimize impact on the air environment

- To arrange the signs at the construction site.

- The construction site area has a construction plan and a suitable material supply plan. To limit the concentration of material at the same time.

- To apply advanced construction methods, to mechanize the operation and the process of construction as much as possible.

- Around the site, the temporary storage area is covered with a sheet, with a height of about 3 m.

- Regularly cleaning at the gateway to the site and related areas.

- On sunny days, to limit the level of dust pollution in the construction site, often spraying water, limiting part of sand dust may follow the wind to the air to affect the surrounding building.

- When transporting building materials, vehicles must not carry more than 90% of their volume and must be covered to avoid cracks, cement and sand on the way.

- When loading raw materials, workers are equipped with labor protection to limit dust.

- Strictly inspecting and checking the means of transport and inspecting the technical requirements for specialized construction equipment.

- The project management board shall arrange appropriate transportation time for construction materials, avoiding activities during peak hours.
- Supporter is treated right in the day, not stagnated significantly, stunning the construction site.
- For mechanical operation: mainly in the outdoors, airy space, in addition, workers will be equipped with full labor protection: glasses, mask,...

(2) Waste water pollution control

☞ To control pollution caused by domestic wastewater

- At the construction site, the Project Management Unit will equip mobile workers with toilets.
- With the maximum number of workers around 500-600 people, the contractor will equip 10 mobile toilets. Toilet is made of composite material, size: length: 90 cm x width: 130 cm x height: 242 cm; about 2.8 m³.
- Periodically wastewater and feces from portable toilets shall be transferred to functional units for removal to other places in accordance with regulations.

☞ Rainwater pollution control

Control of pollution caused by stormwater runoff and flooding during the construction process is very necessary to ensure no environmental pollution, good drainage at the construction site and no impact on the surrounding area. Measures to prevent and control environmental pollution shall be applied as follows:

- Good management of construction materials and wastes generated at the construction site in order to limit the spillage into the water drainage, thus obstructing the flow of water and polluting the environment.
- Drainage drainage around the construction site before the construction of the project, and temporary manholes on the drainage shaft. Rainwater is taken into the existing canal.
- Sludge is dredged regularly and is hired by a construction contractor to collect and dispose of it according to regulations.
- Concentration on the dry season to reduce the impact of runoff.

☞ Construction wastewater control

- As mentioned above, the amount of wastewater to be treated includes the equipment rinsing, the washing water, etc. But the most likely water impact is the amount of water from the process of washing the vehicle carrying construction materials before out of site, the main components in the wastewater include sandy soil sticking to the wheel and a small amount of oil.

- All vehicles before leaving the site must go through the car wash (arranged near the entrance), where the car is cleaned of sand and dirt that can affect the environment when it comes out. from the site (dirty roads, dust to the environment ...). To limit the effect of this wastewater, the wastewater from the car wash process will be fed into the sedimentation tank and then into the grease separator.

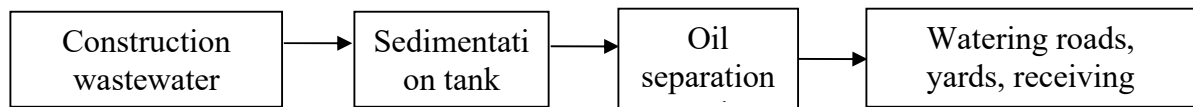


Figure 4. 1 Construction wastewater treatment plan

Sedimentation tank with dimensions of Length x Width x Height = 1.0 m x 0.8 m x 1.0m will be constructed of brick.

Grease tank with dimensions of Long x Width x Height = 0.5 m x 0.4 m x 1 m, will be constructed of brick, concrete.

- Wastewater after settling equipment is reused for irrigation of roads, yards or drainage systems in the area.

- The oil extracted from the oil extracted tank will be disposed of along with the waste generated during construction.

✎ To minimize the impacts on the water environment

- Equipping mobile toilets for construction workers, avoiding feces, urine being washed by rain water, polluted surface water.

- Wastewater generated during the construction process is mainly sediment, oil and grease so that all wastewater will be collected and pre-treated by the method of settling and separating the oil before discharging into the receiving source.

- The PMU always strictly controls activities that affect the water source.

+ Groundwater:

- Manage the waste generated, avoid waste spread in the construction area.

- Do not leave pollutants such as grease, gasoline, spills or seepage into the soil.

- Execute the foundation properly, avoid affecting the quality of underground water.

(3) To control pollution caused by solid waste

Construction waste:

- Major solid wastes in this period are construction materials, construction waste, broken coffins, broken iron, stone, soot ... will be concentrated at the site. according to regulations.

- Solid waste types such as soil, sand and stone are contracted by the contractor with the functional unit. In cases where the quantity of construction Solid waste is too much, the construction contractor shall be responsible for contracting the unit with the function of dealing with the day.

- Types of scaffolds, iron, steel will be reused.

- Construction materials: are collected and sold to establishments wishing to recycle. For non-recyclable packaging, contractor will contract with functional unit to collect and treat as regulated.

Daily solid waste: The amount of domestic waste generated by construction workers estimated at 250-300kg/day will be controlled as follows:

- Making the rules of the site require workers not littering indiscriminately

- All household waste will be collected and concentrated in 10 containers of 80 liters capacity, which will be located at each construction site at the construction stage to facilitate waste disposal. revoke. Employer (or building contractor) contract with unit with daily collection and transportation function.

Hazardous waste: The Employer will take the following measures to control:

- Restricting the repair of vehicles and machinery at the site (repair only in case of incidents)

- Collecting 100% waste oil and rags in separate containers located in the project area

- Equipped with 25-liter tanks, for each type of hazardous waste placed in the temporary storage facility at the site.

- The Employer shall contract with units which have the function of gathering and handling every 1-2 months.

In addition to the above effects when conducting construction activities, the land environment is also significantly affected. In order to minimize the impact on the soil environment, a number of measures such as:

- Minimize excavation and disturbance of soil layers;

- Do not let pollutants such as grease, oil, spills or seepage enter the soil;

- Collect wastewater and concentrate solid waste for treatment

- The foundation must be processed in accordance with the technical requirements.

4.1.2.2 To minimize non-waste related impacts

☞ Control of pollution caused by noise, vibration

Measures to reduce the impact of noise and vibration during construction are as follows:

- In order to minimize impacts of noise and vibration of the construction site, the construction management board shall have a reasonable construction plan, the vehicle for the transportation of construction materials and equipment at the time of preference, suitable and reasonable distance, not concentrated operation, limiting the sources of noise at night.

- Check of the vibration level during the construction process to set the construction schedule appropriate to the level of noise standards. Reasonable organization of work, in order to create non-vibration free intervals of approximately 20÷ 30 minutes and with a maximum duration of one continuous working time of no more than 4 hours.

- The construction machines and equipment with a background attached and checked, maintained and monitored regularly the technical parameters.

- The construction units will use modern construction methods with small noise level for foundation construction.

- Do not crush rock at site to avoid noise, vibration from the process.

☞ To minimize impact on traffic

In order to minimize impacts from project activities to traffic, the Employer in conjunction with the construction unit shall apply the following measures:

- Coordination of construction material trucks in the construction phase avoids the large concentration of vehicles on the road at the same time. Arrange appropriate time of transportation, not overlap so many vehicles waiting for each other obstructing the outside.

- Coordinating the activities of the transport vehicles to avoid peak hours.

- When transporting construction materials, vehicles must not carry more than 90% of their volume and must be covered, avoiding the cracks in cement, bricks and sand on roads which cause environmental pollution.

- The means used in transportation and construction comply with the standards of the Vietnam Register.

- Commitment to ensure traffic safety for people in the surrounding area as well as construction forces.

- Commitments to overcome, repair the road surface damage around the project if the cause of the damage is due to the construction of the project.

- Compliance with the law on transportation, compliance with the time allowed for circulation of trucks transporting materials.

☞ *To minimize impact on social security*

Impacts from the construction worker camps include:

- Pollution of soil and water from domestic waste and household waste
- There may be social evils such as alcohol, gambling ...

In order to limit the above effects, the following measures may be applied:

- Increased use of local manpower to reduce the construction of multiple camps

- Report local authorities, apply for temporary accommodation for camp workers during the construction process.

- Ensure adequate sanitation facilities for construction workers such as 15 mobile toilets as well as domestic solid waste will be collected and treated according to regulations.

- Develop clear and clear internal rules and organize worker management.

- Clear sewer, stagnant water, mosquito larvae and mosquitoes to prevent malaria, dengue fever.

- The Employer will work closely with local authorities to easily control the situation of social security and social in the region during the construction process.

☞ *To minimize impacts on surrounding buildings*

- Arranging the time of transportation of vehicles into the construction site, according to the shift, not overlapping, so many vehicles waiting for each other, causing obstacles outside the works.

- The vehicles transported out of the works must be carefully guarded, avoiding leaving materials, sand dirt on roads, obstructing traffic, increasing the amount of dust in these roads.

- Establishing a site protection team to coordinate the means to avoid congestion affecting the traffic and operation of the surrounding buildings.

- Sanitation around the site avoids shattering materials that affect the environment and urban beauty.

- Covering the construction site, avoid dust dispersed into the environment, affecting the surrounding area.

- At the same time, implementation of mitigation measures for dust, gas, noise, wastewater and solid waste as mentioned above.

4.1.3. Measures to prevent, mitigate negative impacts of the project in the operation phase

4.1.3.1. Measures to prevent, minimize negative impacts related to waste

4.1.3.1. Measures to prevent, mitigate impacts related to waste

(1) To control pollution caused by dust and exhaust gas

☒ Dust and emissions from the operation of means of transport

In order to minimize the impact of the vehicles entering and exiting the project, the following measures are taken:

- Asphalt concrete for internal roads, for the pavement to be paved with bricks, planting trees along internal roads in order to create a landscape of the area and at the same time improve the ambient air environment.

- Regularly cleaning the streets to minimize the amount of dust from roads that are likely to rise.

- In the sunny season, the water is sprayed to reduce the dust and heat caused by vehicles moving into and out of the area.

- Planting trees around the project area. Heavy green foliage can absorb smoke and gas mixtures such as: SO₂, CO₂, nitrogen compounds, phosphorus, other toxic elements such as Pb, Cu, Fe ...

☒ Odor

– For odors arising from garbage bins:

+ Garbage stored in closed containers should limit the spread of odors around.

+ Garbage is collected daily to limit the degradation of garbage and reduce odors.

– For odors arising from sewage drainage systems:

+ The drainage system is built closed and underground so the smell is also arising.

+ Regularly checking to detect and repair leaks in time, avoid gas leakage into the environment causing odors.

(2) Waste water pollution control

General principles:

The rain water and sewage drainage system of the project is separated and drained according to the self-flowing principle, using drain pipes with

reinforced concrete structure. The following is a diagram of the principle of collection and disposal of wastewater of the project as follows:

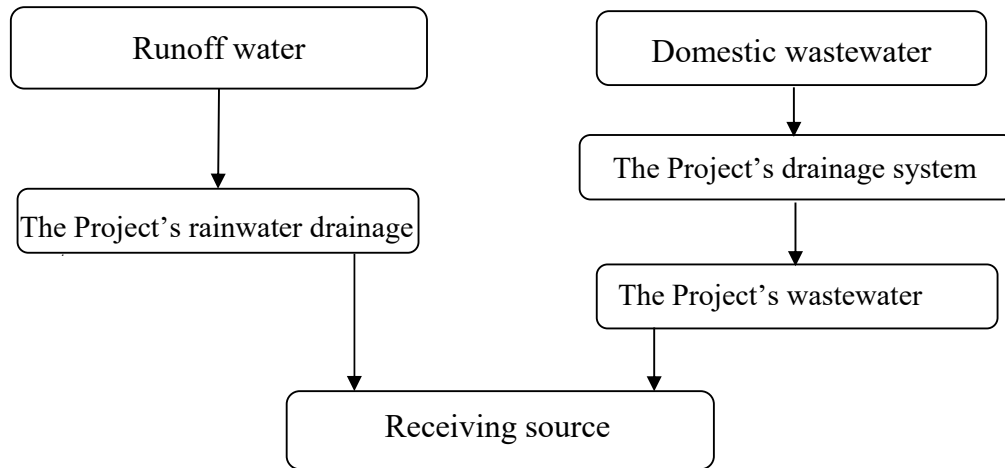


Figure 4. 2 - Overall drainage diagram

☞ To control pollution caused by domestic wastewater

Wastewater flow:

Domestic wastewater is generated mainly by the staff working in the factory (about 75 people), the wastewater volume is calculated by 10,315 m³/day.

Characteristics of wastewater:

The basic characteristics of domestic wastewater are high levels of organic substances, easily biodegradable (such as carbohydrates, proteins, fat ...), nutrients (phosphates, nitrogen), germs, solids and smell. (Estimation of loading and concentration of pollutants in domestic wastewater is presented in Table 3.19)

Processing Technology:

- Waste water from the canteen is led through a grease separation tank.
- Wastewater from the toilet is led through the septic tank.

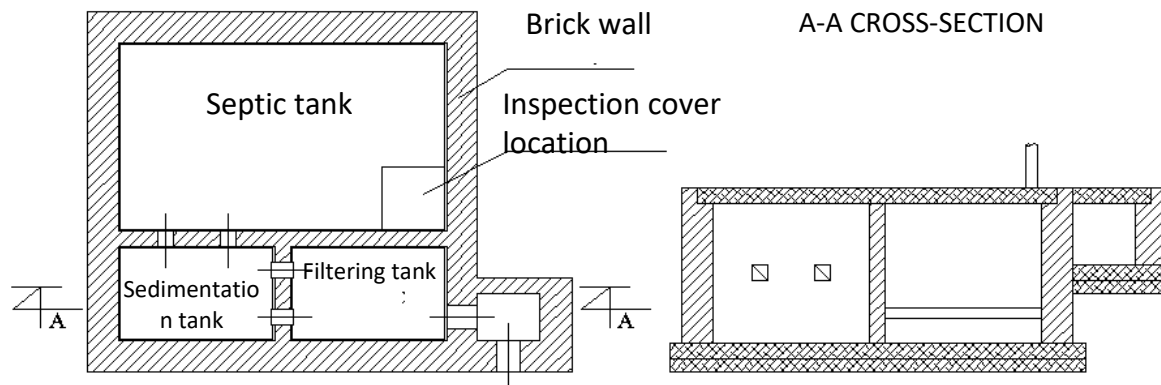


Figure 4.3 Septic tank

Septic tank has two simultaneous functions: sedimentation and sedimentation. Sediment is retained in the tank for 3 to 6 months, under the influence of anaerobic organisms, organic matter decomposes, partially forming gases and partially forming dissolved inorganic matter.

Waste water after septic tank, the concentration of pollutants is reduced by 40-60%, but still higher than permitted by the Vietnamese standard QCVN 14: 2008/BTNMT.

Therefore, the Employer will contract with the professional unit to calculate the design of the wastewater treatment system for the project, ensuring that wastewater after treatment meets prescribed standards before being put into the treatment tank and seepage in the area.

(3) To control pollution caused by solid waste

All solid wastes will be collected, classified, stored and thoroughly treated in accordance with the Decree No. 59/2007/NĐ-CP dated 09/4/2007 of the Government on solid waste management; The Decree No. 38/2015/NĐ-CP dated 24/4/2015 of the Government on waste and waste management and Circular No. 36/2015/TT-BTNMT dated 30/6/2015 of the Ministry of Natural Resources and Environment on the management of hazardous waste.

➤ Domestic waste

Arranging garbage cans in the factory area. Solid waste of workers is collected in the trash can of 100 liters. The Employer will contract with local authorities to collect the waste once a day to prevent waste from decomposing.

➤ *Hazardous waste*

Based on the amount of hazardous waste incurred, the Employer will carry out procedures to submit to the Department of Natural Resources and Environment of Binh Thuan province to source hazardous waste for Hong Phong 1A solar power plant as prescribed.

Measures for collection, storage and treatment of hazardous waste comply with the Decree No. 38/2015/NĐ-CP, dated 24 /04/ 2015 of the Government on solid waste management and the Circular No. 36/2015/TT-BTNMT.

Oil wipe in the periodic maintenance process

Clean equipment with oil, grease in the process of maintenance of machinery, equipment is collected in a centralized location in the plant and contract with the unit has the processing function. To ensure the collection, transportation and treatment of waste according to the Government's Decree No. 38/2015/NĐ-CP, dated 24/ 04 / 2015 of the Government on solid waste management.

Waste oil of transformers

The Employer is committed not to use PCB-containing transformer oil.

Transformer oil type: NYTRO LIBRA or 25 # Karamay; During the installation of the transformer, all oil must be poured into the oil tank of the transformer; In the absence of incident, basically no need to add oil; In addition, there are reservoirs of oil reserves, stored in oil stores; An oil dump is designed underneath the transformer and a nearby incident oil tank can contain all the insulating oil of the largest transformer.

When a transformer has a leak or explosion hazard, or when replacing a transformer oil, the transformer oil is collected and stored in an oil spill tank (capacity of 5.5 m³). After that, the Employer shall contract with the unit having the function of transporting and treating hazardous wastes for treatment according to regulations.

Oil collection process: to drain oil from the transformer in case of trouble, in the station has arranged common oil tank. The oil tank can contain 5.5 m³ of oil, enough for all the oil contained in the transformers and a part of fire water made of reinforced concrete marked B15 (M200), with lid covered. At the bottom of the tank, there is an oil pit. The basement was built under the ground, surrounded by macadam, the walls were arranged with steel steps. After the oil is collected into the oil pit, the Employer will contract with the unit responsible for treating hazardous waste to be disposed of in accordance with the treatment of hazardous waste.

For solar cells

During operation, the plate replacement process is about 0.05%. Due to the low volume, the replacement panels will be stored at the hazardous equipment storehouse, then the Employer contracts with the unit responsible for treating the hazardous waste for disposal.

When the project life cycle is over, the operator will contract with the production unit to recycle the cost panels that have been included in the Total Investment. The battery recycling process is as follows:

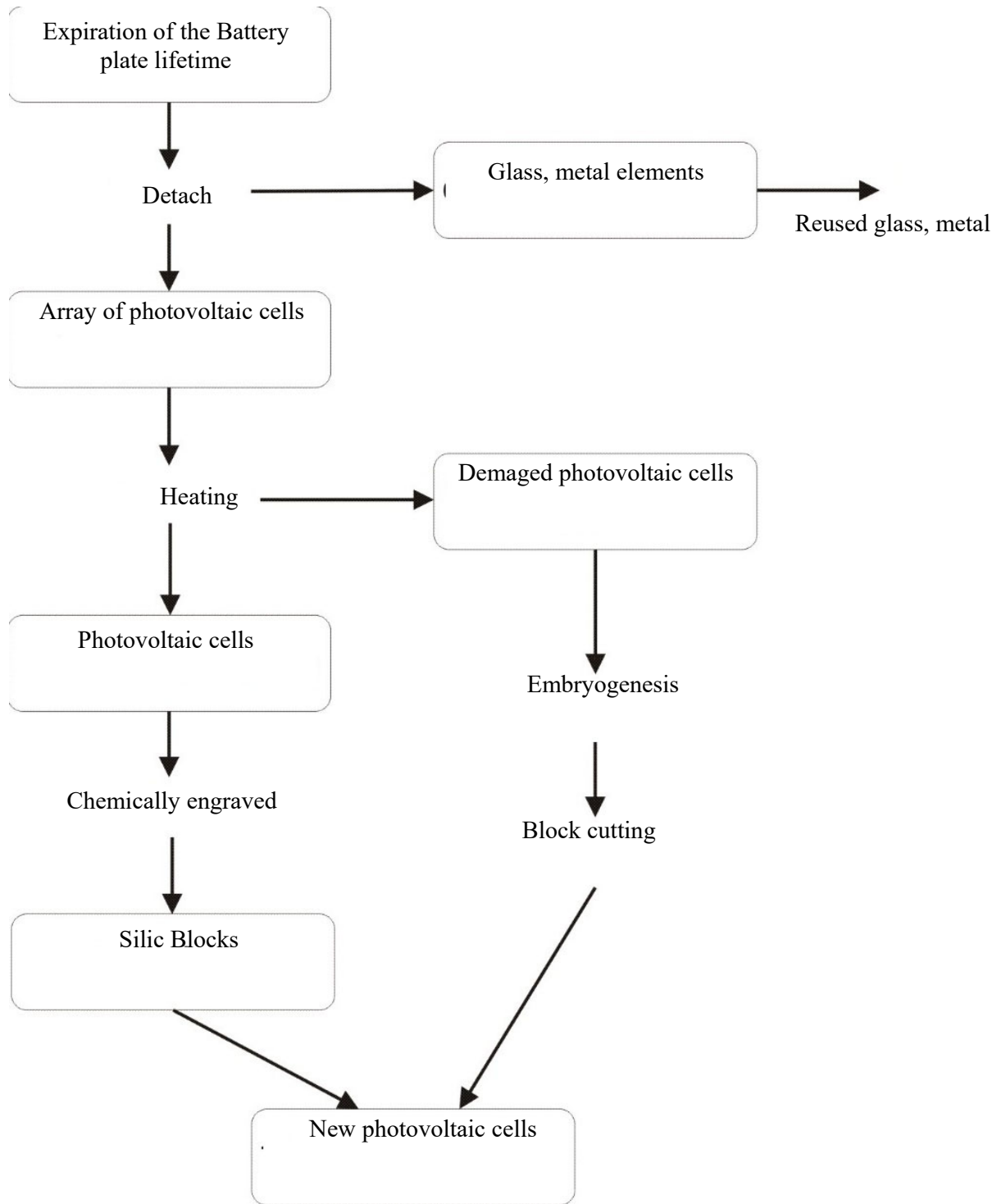


Figure 4. 4 Solar Cell Recycling Technology

Minimized area: Factory area, transformer, Inverter, Line connection.

4.1.3.2. Measures to prevent, minimize negative impacts not related to waste in the operation phase

Measures to minimize the impact of electric field strength on the environment to human health

Compliance with the provisions of the Decree No.14/2014/NĐ-CP (detailing the implementation of the Electricity Law) and the QCVN 25:2016/BYT (the National technical regulation on frequency electromagnetic fields industry - exposure level allows electromagnetic field industry frequencies at workplace).

Some management and control measures need to be taken during the operation of the plant as follows:

- ✓ *To prevent from the influence of electromagnetic fields on operators*
 - In order to ensure absolute safety, operators must comply with the operating procedures to ensure safety requirements;
 - Equipped with magnetic shield when employees work in high magnetic field. In addition, when working in areas with high electric field effects, it is required to comply with the branch standards on the permissible level of electric field frequencies and to determine the working conditions;
 - Having adequate labor protection equipment, observing the regulations on working time in areas with high electric strength to ensure safety;
 - Implementing the shift working mode to ensure the time of exposure to the electric field within the specified limits.
 - Periodically measuring and evaluating electromagnetic fields at least once a year and in accordance with the provisions of the Labor Code and the Law on occupational safety and health..
 - If the industrial electromagnetic field frequency in the workplace exceeds the allowable limit, the Employer must immediately apply measures to improve the working conditions and protect the health of the laborers.

- ✓ *To prevent from the effects of electric fields on the environment*

According to the survey, there are no households in the project area so it does not affect the health of the people. However, during the project operation, the plant must meet the requirements of electrical safety to avoid affecting the surrounding people:

It is forbidden to carry out all work in the power grid safety corridor if using equipment, tools and means capable of breaking the safe distance of discharge according to the voltage level. In special cases, due to urgent requirements of the national defense and security work, there must be agreement with the power grid managing units on the necessary safety measures;

The Employer will be responsible for organizing the environmental monitoring, electrical safety during the operation, and the cost of avoiding the electric field of the project is included in the operating costs of the project.

✓ *The overhead power transmission line safety corridor*

To ensure the provisions of the Decree No. 14/2014/NĐ-CP dated 26/02/2014 of the Government, on detailing the implementation of the Electricity Law on electricity safety.

For 220 kV high-voltage power grid: The width of the corridor is limited by the two vertical sides to the two sides of the line, parallel to the line, the distance from the outer line to each side when stationary. The voltage for the 220kV voltage is 6.0m. The height of the corridor is calculated from the bottom of the column foundation to the highest point of the building plus the vertical safe distance is 4.0m.

For areas in the plant, transformer station, inverter station, the Employer will arrange safety corridors and signs to employees as well as people to avoid causing unfortunate accidents.

4.2. MEASURES FOR MANAGEMENT, PREVENTION AND MANAGEMENT OF THE PROJECT'S INCIDENTS AND RISKS

4.2.1. Measures to manage, prevent and respond to risks and incidents of the project in the construction phase

☞ Occupational safety

The Employer coordinates with the construction contractor to implement the following measures to ensure the safety of workers on site:

- Training on occupational safety and health for construction workers before starting the construction of the project.
- Compliance with the regulations on labor safety when organizing the construction, the issue of machinery and equipment, measures to prevent from electric accidents ...
- Strict adherence to road traffic safety throughout the process of participation in traffic.

- For off-site areas: To arrange signal boards for the means of transport and people going back and forth.
- Arranging reasonable transportation and travel.
- At night, the construction site is equipped with lights.
- The construction machines and equipment must be enclosed with the curriculum vitae and inspected and monitored regularly.
- Workers who directly construct and operate construction machines must be properly trained and practiced in the event of incidents and always be present at their places, operate and check and operate technically correctly
- Equipping labor protection devices for construction workers according to the current regulations of the Ministry of Labor, War Invalids and Social Affairs
- Conditions must be met for medical facilities. Tools and equipment as well as the necessary contact addresses in the event of a malfunction should be clearly indicated: Disposable faucet in case of trouble, medicine cabinet, oxygen supply; Emergency contacts: hospital, fire department ...
- Applying the propaganda and management of workers closely. Prohibition of social evils in the construction area.
- Coordinating with local authorities to set up a management team, with rules for the construction site and workers' camp.

☞ Fire and Explosion prevention

The Employer coordinates with the construction contractor to implement the following measures to prevent fire and explosion on the site:

- Training fire prevention for construction workers before starting construction project.
- Complying with regulations on the order of arranging warehouses, yards, raw materials (especially those that do not contain fuel near heaters or pass through many people), lightning protection ...
- Construction machines and equipment shall be managed through the curricula vitae, periodically examined and registered at state functional agencies.
- The electrical equipment must be millet, hanging high off the ground to avoid touching electricity.
- Equipping fire extinguishers in storage (foam, CO2, sand ...). Also setting up fire alarms, beacons and good information.

☞ ***Measures to minimize equipment damage, traffic accidents***

In order to prevent the above incident, the Employer and the construction contractor will apply the following measures:

- Periodical inspection and maintenance of construction machinery and equipment on site.
- Requiring the unit to execute the construction machinery and equipment at the right capacity to meet the construction work.
- Coordinating traffic to the site to avoid excessive concentration of vehicles at the same time.
- Reducing speed when traveling on site.
- Installing signs at regular parking areas.

☞ ***Prevention from environmental incidents***

- For mobile toilets: regularly monitor the operation of mobile toilets, maintenance and periodic maintenance, avoid any possible incidents such as: faecal containers, urine filled, causing odors stinky in the toilet ...
- For waste storage areas:
 - + Sheltered waste cover, the surrounding edges avoid rainwater washed by the waste (solid waste, waste oil ...) causing obstruction of the flow and polluting the environment.
 - + The hazardous waste storage area is divided into several lots. These lots are designed at the appropriate distance according to regulations on waste storage, limit the interoperability between types of waste and fire and explosion in the storage area. Each storage area is equipped with warning signs and fire protection equipment, labor protection devices and repair materials if any problems occur.

4.2.2. Measures to manage, prevent and respond to risks and incidents of the project in the stage of project operation

☞ ***Reducing electric shock***

During the design process, the safety issue is considered very carefully so the risk of failure is very low if the safety regulations are complied with. When the problem occurs, the protection relay automatically switches off to protect the person from electric shock. In addition, the transformer is also protected grounded to ensure safety.

All metal structures in the station are connected to the grounding system of the station, bonded by C-clamp, bonded at the thermo-welded locations.

Earthing system is arranged and calculated to ensure safety for people and equipment in all working modes. The grounding resistance of the system ensures that R_{nd} is $<0.5\Omega$ at any time of the year.

Fire & explosion prevention and response

a/. Fire Prevention System:

General requirements:

At the plant is equipped with fire alarm system automatically placed in the control room and distributor, fire alarm by the siren, flashing lights;

Fire-fighting systems for gas-carbon dioxide (CO₂) gas-fired electric appliances;

Oil fire-fighting system using chemical flasks, dry sand ...;

The 220kV transformers fire alarm system includes four explosion-proof heat detectors mounted above the transformers grille, controlled by two separate zones;

Power transformers, equipped with fire protection system inside the machine at the beginning of the small fire appear, then the oil pressure in the machine increased, the fire signs arise;

Oil pressure and oil pressure monitoring systems in the transformers will isolate the risk of fire and fire alarm signals.

Plan of arrangement of fire alarm equipment:

Apply the Vietnamese Standard No. TCVN 5738-2000 - Fire alarm system - Technical requirements and appendices attached to the plan to arrange equipment fire alarm system for each area as follows:

Table 4. 1 Installation of fire alarms

o.	Work item	Production level	Fire resistant level	Fire alarms
1	Operators and distributors	E	I	Fire alarm button; fire alarm; heat detectors and smoke; heat detector; Fire detectors
2	Transformers	D	II	Explosion-proof thermostat

Plan of installation of fire-fighting equipment:

Requirements for installation and use, stipulating the equipment and management of fire-fighting equipment for each area as follows:

Table 4. 1 Plan of installation of fire-fighting equipment in the region

No.	Work item	Production level	Fire resistant level	Fire alarms
1	The transformer location	D	II	Sandbanks, shovels Portable CO2 gas bottle 5kg / bottle Air tank CO2 trolley 30kg / vehicle Powdered Asul T35 trolley 35kg / vehicle
2	Area of the operators and distributors	E	I	Installation of central fire control system. Portable CO2 gas bottle 5kg / bottle Air tank CO2 trolley 30kg / vehicle Powdered Asul T35 trolley 35kg / vehicle

b/. Management measures

Set up rescue teams to respond to fire or electric shock at connecting points, members being factory operators;

Make a fire prevention plan and regularly rehearse with the guidance of the FFFF;

Regularly inspect and maintain fire protection equipment ensures that they are always in good condition;

Regularly inspect and maintain transformers, wiring and auxiliary equipment so that they are always in the best condition;

Raise the awareness of officials, workers operating transformer stations and connecting lines on fire prevention and fighting.

Prevention and repair of oil leakage

Oil leakage prevention:

During the operation of the transformers, some oil leakage and remedies are described as follows:

Table 4. 3 Oil leakage phenomena and remedies

No.	Phenomenon	Causes	Remedy
1	High oil level in the transformers	Ambient temperature is too high; The transformer is overloaded.	In this case, the oil level will be higher than the above line; Reducing load on transformer, avoid overloaded MBA operation.
2	Low oil level in the transformers	The ambient temperature is too low; Possible oil leakage.	In this case, the oil level will be lower than the lower line; Checking oil leak point. Stop running the MBA and repair the MBA at the oily place.
3	Oil leakage in the por.	Leakage at the transformer; Bushing.	Replacing the transformer bushing; If the oil flows from the rubber joint, it is necessary to replace the rubber joints.

Oil gathering in case of transformers breakdown:

For transformer substations, force transformers are oil immersion type, in normal operating mode there is no oil leakage from the transformer. The probability of the transformers explosion is very small. However, in the event of the transformers incident, oil can spill over and spread to the surrounding environment.

To collect oil from the transformers in the event of an accident, prevent oil leaks from affecting the environment and the ecosystem. In the process of designing and constructing transformer stations, the oil reservoirs must be arranged. Oil tank made of reinforced concrete class B15 (M200) with lid. At the bottom of the tank, there is an oil pit. The basement was built underground, surrounded by macadam slabs, the walls of the tank are arranged in steps of steel. The oil is collected in the tank and then pumped into the container. This amount of oil will be considered if remaining usable will be recirculated after the transformers is corrected, if the oil is considered non-reusable and the waste oil is to be disposed of. The unit has the function to collect and treat as hazardous waste.

☞ Protection against lightning

Lightning protection for the transformers by lightning valves located near the input side of the transformers.

Lightning protection shall be directed to the station by lightning strikes mounted on the gate posts and lightning collecting needles mounted on the lightning rods in the station.

Lightning conductor is connected to ground station with bare copper wires, with twisted strand of 120mm².

For direct lightning protection, the wiring harness is designed to withstand two lightning strikes. The protection angle between the lightning conductor and the power cable at the top of the pole shall be less than 20°, ensuring the requirements of the Standard No. 11 TCN-19-2006 (Article II.5.63).

☞ Operate Safety of transformers

a/. Record and check:

For the safe operation of the transformers, the operator must record the transformers parameters and check for hours as follows:

- Write the parameters at the transformers:
 - + Transformers oil level;
 - + Oil temperature;
 - + Coil temperature.
- Check:
 - + External status of transformers, oil leakage....
 - + Color of dehumidifier:
 - + Green: Normal.
 - + Pink: Desiccant is unable so it requests a new replacement.
 - + Verifying the operation of four transformer cooling fans in the AUTO mode.
 - + If the temperature of the fan is too high and the fan is not running, the fan must run the manual mode and the incident should be reported to the shift manager;
 - + Listen the noise in the transformer: the voice must be quiet and smooth;
 - + Control panel: must be clean and normal;
 - + Check status: porcelain, conductor, oil, cable, grounding the cabinet must be normal.

b/. Cases of emergency stop of transformers:

The sound is loud, uneven and shaky inside;
Oil transformers spills out;
The transformers increase abnormally;
The color of the oil changes abruptly;
Porcelain is broken, discharge the porcelain surface;
Accident or fire in the transformer range.

When the transformers is cut by the relay, it must quickly identify which relay is acting, causing the impact:

If the relays, offset relays, safety valves do not get the transformers to work again. Have to isolate the transformers from the system, organize the test to determine the cause. It is only permitted to reinstate the transformers when it has been approved by the Director or Deputy Director of the Plant and the Grid Operator;

If another relay fails, the failure of the transformers itself can be determined by allowing the power to be turned off once but with the consent of the grid operator.

☞ Safety in management, operation and maintenance

The management of the operation and repair of power grids within the project scope includes: regular repair and maintenance work, timely repair and overhaul of the direct operating agency

In order to minimize the negative impacts, to limit incidents in the grid, to ensure a safe operation of the power grid and to limit occupational accidents, in the process of managing and operating the operation and maintenance workers To fully and seriously observe the regulations on safety when performing the management, operation and repair work. To carry out the form of working cards, operation cards and procedures to work in accordance with regulations. To comply with the "Technical safety procedures in management, operation, repair and construction of electric lines and stations" promulgated together with the Decision No. 1559 EVN/KTAT of the General Director of EVN dated 21/10/1999, the Circular No. 31/2014/TT-BCT of the Ministry of Industry and Trade dated 2/11/2014 detailing some electricity safety issues.

4.3. ORGANIZATION OF IMPLEMENTATION OF PROJECTS AND ENVIRONMENTAL PROTECTION MEASURES

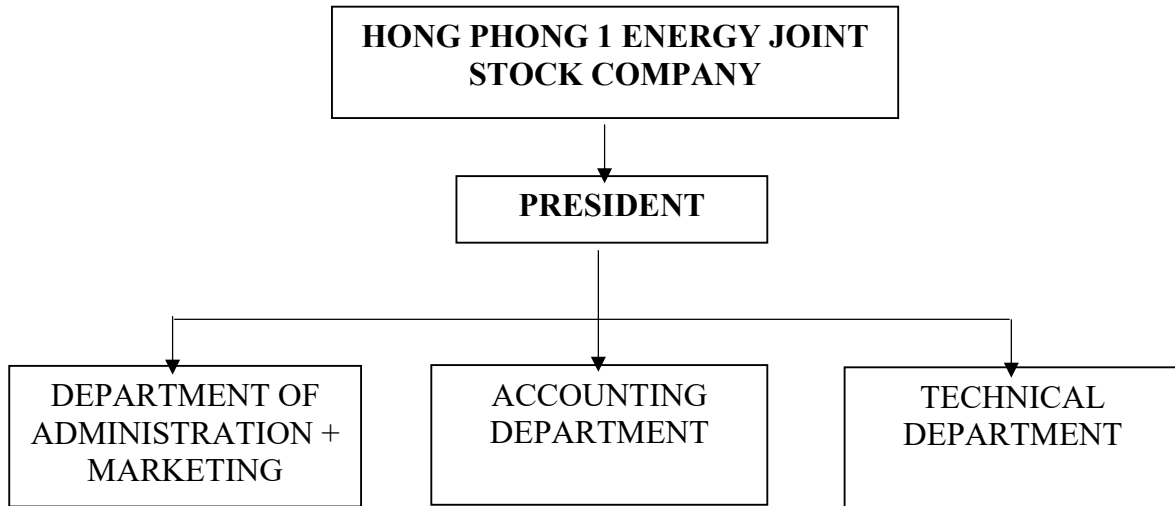
4.3.1. Funding for environmental protection activities

Table 4. Funds for environmental protection activities of the project:

No.	Work item	Total amount
I	CONSTRUCTION STAGE	
1	Cost for measuring the quality of the air environment (04 air samples x 2 times = 08 samples)	Estimated <i>VND 40,000,000</i>
2	Supervision of the collection and disposal of wastes at the site (container, collection contract): 02 times x VND 2,500,000 / time = VND 5,000,000	Estimated <i>VND 5,000,000</i>
3	Supervision of occupational health and safety at work site: 02 times x VND 2,500,000 / time = VND 5,000,000 (temporarily calculated)	Estimated <i>VND 5,000,000</i>
II	OPERATION STAGE	
1	Monitoring the collection and treatment of living substances, hazardous wastes (containers, centralized storage, collection contracts).	Estimated <i>VND 10,000,000</i>
2	The cost of monitoring the electromagnetic field (50,000 VND / measurement point x 5 points) / 06 months and implemented throughout the operation period.	Estimated <i>VND 500,000/ year</i>
3	Monitor the collection and treatment of daily effluent (VND 2,000,000 / sample x 04 samples) / 06 months and carry out the operation.	Estimated <i>VND 16,000,000/ year</i>

4.3.2. Organization of project management and operation

Hong Phong Energy Joint Stock Company 2 is the unit directly managing, operating and supervising the project when operating.



- Operation stage: Leaders, engineers, skilled workers are 40 people, 35 unskilled workers, 7 guards. In particular, the environmental staff for the plant in the technical department with the University degree or above is 3 people.

CHAPTER 5: ENVIRONMENTAL MANAGEMENT AND MONITORING PROGRAM

5.1. ENVIRONMENTAL MANAGEMENT PROGRAM

The environmental management program is implemented in the preparation, construction and operation phase, including the following main contents:

Table 5.1 Environmental Management Program

Operational phase of the Project	The Project's activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
Preparation stage	- Site clearance	Pollution by solid waste + Cleared trees, domestic waste)	- Clearing the site - To organize the management and collection of daily-life wastes and handle them by functional units	-	Equipped in the luminescent time and space	The Employer / The Construction Contractor	Hong Phong Energy Joint Stock Company 2, People's Committee of Hong Phong Commune, People's Committee of Bac Binh District
	- Site	Pollution from exhaust gases luminescence equipment and biomass	- - Equipping workers with masks and labor protection	-			

Operational phase of the Project	The Project's activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
Preparation stage	clearance	transport vehicles	- Reasonably arranged time of operation of means of construction and transportation.				Hong Phong Energy Joint Stock Company 2, People's Committee of Hong Phong Commune, People's Committee of Bac Binh District
		Domestic wastewater of workers Domestic waste:	Renting mobile toilets (02 pieces)	72.000.000			
		Emissions from truck transport and ground leveling equipment	- Workers are equipped with labor protection - Gradually sand leveling as soon as the gathering down.	-			

Operational phase of the Project	The Project’s activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
			<ul style="list-style-type: none"> - Trucks carrying no more than 90% of the volume of the container and covered. - Apply advanced construction methods, mechanize 				
		Domestic wastewater of workers Domestic waste	<ul style="list-style-type: none"> - Renting mobile toilets (02 units), taking advantage of the luminescent stage - To organize the 	- 1.000.000			

Operational phase of the Project	The Project’s activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
			management and collection of daily-life wastes and handle them by functional units				
Construction phase	Construction activities of the main and sub-projects of the project	- Emissions from traffic means and construction equipment: dust, noise, exhaust gas (CO, NO2, SO2) ...	- Transported material is shielded from shattering. - Periodically inspecting machinery and equipment. - The construction area and the building material area are covered with	-	Equipment during construction	The Employer / The Construction Contractor	Hong Phong Energy Joint Stock Company 2, People's Committee of Hong Phong Commune, People's Committee of Bac Binh District
Construction phase					Equipment during construction	The Employer / The Construction Contractor	

Operational phase of the Project	The Project’s activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
			temporary walls (made of wood or metal). - Restricting the collection of materials at the same time. - Spraying water regularly to limit dust, sandy soil to the air.				
		Pollution generated by the solid waste	Minimizing pollution caused by construction waste: collection (re-use), reuse, contract with the unit that	-		The Employer / The	Hong Phong Energy Joint Stock Company 2, People's Committee of Hong Phong

Operational phase of the Project	The Project's activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
			has the function of collecting and transporting			Construction Contractor	Commune, People's Committee of Bac Binh District
		Pollution from sewage	Construction of sand settling tank and separation of grease				
		Heat pollution and noise	- Use of new equipment. Having reasonable construction plan - Use of labor protection devices				
	Activities of construction workers	Domestic waste workers	- Rent more mobile toilets (15 units)	360.000.000			
		Domestic solid	Classification,	3.000.000			

Operational phase of the Project	The Project's activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
		waste	collection of containers in accordance with regulations and contract collection.				
		Construction waste	Make regulations at the site and disseminate internal rules to workers.	-			
		Hazardous waste	- Hanging safety signs and warnings at the site	-			
	Tracking build process	-	- Disseminate safety knowledge to workers	50.000.000			
Operational	Operation of	- The operation	Environmental	-	During the	The	Department

Operational phase of the Project	The Project’s activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
phase	power plants, inverter stations, transformer stations and connection lines.	of the means of transport into and out of the plant	monitoring program periodically		operation	Employer	of Natural Resources and Environment of Binh Thuan province, People's Committee of Hong Phong commune, People's Committee of Bac Binh district
	Operating power plants, inverter stations, transformer	Impact on water environment: - Domestic waste water from	- Toilet with septic tank (built during construction stage):	Calculated in the construction cost of the project	Building in the construction phase before the project goes into operation and implemented	The Employer	Department of Natural Resources and Environment of Binh

Operational phase of the Project	The Project’s activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
	stations and connection lines	employees working in the factory	collection of domestic wastewater from transformer operators to the underground septic tank.		throughout the operation		Thuan province, Department of Industry and Trade of Binh Thuan province People's Committee of Hong Phong
		Domestic waste of workers	Placing garbage cans in the factory area, transformer station. Solid waste of the operator is collected in	Included in operating costs	During construction		Commune, People's Committee of Bac Binh District

Operational phase of the Project	The Project's activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
			the garbage. District environmental sanitation will transport domestic waste to hygienic treatment.				
		Grease and grease stains can periodically cure and contaminate the environment	- Cleaning equipment with oil and grease during the maintenance of the plant, transformer station is	Included in operating costs	During construction		Department of Natural Resources and Environment of Binh Thuan province, Department of Industry

Operational phase of the Project	The Project's activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
			collected and contracted with the unit that treats the waste for treatment according to regulations.				and Trade of Binh Thuan province People's Committee of Hong Phong Commune, People's Committee of Bac Binh District
		Impact of electromagnetic fields on operators and people.	Mitigation measures are outlined in Chapter 4	Included in operating costs			
		- Fire and explosion. - Incident of oil spill in transformer	Mitigation measures are outlined in Chapter 4	- The construction works and equipment have been invested			

Operational phase of the Project	The Project’s activities	Impacts on environment	Works, environment protection measures	Environmental friendly measures (VND)	Implementation and completion time	Organization obligation	Supervision obligation
1	2	3	4	5	6	7	8
				and installed during the construction phase. - Maintenance and maintenance costs included in project operating costs.			
	Tracking the operation	-	Periodically environmental monitoring program	VND16,500,000 / year	Every 6 months	The Employer	

5.2. ENVIRONMENTAL MONITORING PROGRAM

5.2.1. During the preparation and construction phase of the project

+ Waste water management:

- To check and supervise the management and contract of daily-life waste collection and treatment arising from the project activities.
- To monitor frequency: 06 months/time.

+ Solid waste management:

- Supervise classification, collection, storage and contracting with functional units to handle the solid waste project in accordance with the Decree No. 59/2007/NĐ-CP dated 09/4/2007 of the Government. on solid waste management; the Decree No. 38/2015/NĐ-CP dated 24/4/2015 of the Government on waste and waste management and the Circular No. 36/2015/TT-BTNMT dated 30/6/2015 of the Ministry of Natural Resources and Environment on the management of hazardous waste.
- Monitoring frequency: 06 months/time.

5.2.2. During the operational phase

+ Wastewater quality monitoring:

- Location, sample symbol:
01 sample of waste water after treatment (*NT*).
- Targets: pH, BOD, TSS, Ammonium (calculated in N), sulfur (measured in H₂S), nitrate (in N), phosphate (in P), vegetable oil, coliform
- Monitoring frequency: 03 months/time.
- Comparative Standard: QCVN 14: 2008/BTNMT (column B, k=1,0).

+ Electromagnetic monitoring:

- Location, sample symbol:
 - + 220 kV TBA pressure bar in Hong Phong 1 Plant
 - + Fence wall system, safety corridor.
 - + Installation equipment room for operation
 - + The line (at the connection with Vinh Tan - Phan Thiet line)).
- Frequency of surveillance: 06 months/time and when requested by state management agencies.
- Comparative Standard No. QCVN 25: 2016/BYT and the Decree No. 14/2014/NĐ-CP.

+ Solid waste, hazardous waste management:

- Monitor the classification, collection, storage and contract with the functional unit to handle the plant's solid waste, hazardous waste.

- Monitoring frequency: 06 months/time.

CHAPTER 6

COMMUNITY CONSULTATION

6.1. SUMMARY ON THE PROCESS OF ORGANIZING COMMUNITY CONSULTANCY

Hong Phong 1 Energy Joint Stock Company sent the Document No.129/HP1-TBCN dated 12/10/2017 attached with the report on environmental impact assessment of the Solar Power Project Hong Phong 1A with capacity of 150MW in Hong Phong commune, Bac Binh district, Binh Thuan province to the People's Committee of Hong Phong Commune

After reviewing the above documents, the People's Committee of Hong Phong Commune responded by the Document No. 61/UBND dated 31/10/2017.

6.2. COMMUNITY CONSULTANCY RESULTS

6.2.1 Opinion of People's Committee of Hong Phong Commune

1. About the negative impacts of the project on the environment, socio-economic and public health:

Basically, the People's Committee of Hong Phong Commune agrees with the environmental impact assessment report of Hong Phong 1A Solar Power Project of Hong Phong 1 Energy JSC. However, in the process of construction, operation and implementation, the project will have some negative impacts on the surrounding environment and the livelihood of some people. Therefore, the People's Committee of Hong Phong Commune proposed after the project is approved for investment, putting into construction and operation of the plant, the project should pay attention to the following issues:

- Having policies to support and equip safety equipment for workers in the project area.

- During the construction period, the operation of the plant will cause problems such as air, garbage, smoke, dust, noise, equipment damage, fire, explosion, impact of the electricity to the health of workers, the surrounding communities.

- During construction and operation of the project, the company must ensure absolute safety and not affect the security, order, life and living of workers and people in the area.

- The project should create favorable conditions and give priority to the employment of local workers, especially the people whose land is in the project area.

2. About measures to mitigate the negative impacts of the project on the natural environment, socio-economic and community health:

Agree with the mitigation measures in the report stated. At the same time, Employers should pay attentions to:

- During the construction process, to ensure absolute safety in work, to well protect the work under construction, ensuring that it does not affect the surrounding area.

- The vehicles transporting construction materials must be carefully guarded not to drop mud or sand on the road surface and obstruct traffic. The transportation must be reasonable, the number of specific vehicles transported during the day, avoid the mass transit caused smoke, dust, noise, affecting the environment.
- Damaged equipment such as batteries, machinery, lubricants and other solids should be collected and treated in accordance with regulations.
- Management of waste water arising in the construction and operation phase, treatment according to the prescribed standards before discharge.
- During the operation period, the Employer must regularly inspect and maintain transformers, connection lines and auxiliary equipment so that they are always in the best operating condition and minimize the problems which can happen to affect people.
- Limited, strict control of electricity, fire and explosion during the operation of the project.
- Periodically inspect the electric safety corridors according to the provisions of law.
- The project needs to build a barrier for the whole project area, avoiding external impacts on the project site such as preventing the impact of animals and human impacts, weather, floods. , landslide caused.
- The project Employer shall closely coordinate with the local authorities in the management of workers, avoiding the situation where the workers cause disorder and security where the project operates.
- The project needs to create a land fund to plant trees around the project area, to minimize the environment, to prevent landslides, to prevent sand and to create landscapes in the project area.

3. Proposals to the project owner:

- Compliance with the Law on Environmental Protection.
- The Employer should commit to implement the corrective measures outlined in the report.
- Employer should closely monitor and coordinate with local authorities to perform well the environment, as well as security and traffic in the area during construction as well as when the project goes into operation.
- Strictly following the mitigation measures stated in the report.

(See attachment to Appendix 2 for written comments of the People’s Committee of Hong Phong Commune)

6.2.1. Opinions of community representatives directly affected by the project

Comments from representatives of the communities in Hong Phong commune on the implementation of the project are attached as Appendix 2.

6.2.3. Feedback and commitment of the project Employer to the proposals, proposals and requests of the People's Committee of Hong Phong commune

The Employer, Hong Phong 1 Energy Joint Stock Company, agrees with the view of the People's Committee of Hong Phong Commune and is pledged to fully implement the

suggestions that the people and agencies have stated as well as mitigation measures as reported in the report.

CONCLUSION, RECOMMENDATIONS AND COMMITMENTS

1. CONCLUSIONS

Based on the analysis and assessment of the impact of "Hong Phong 1A solar power plant project with a capacity of 150MW", the project will be built in Hong Phong commune, Bac Binh district, Binh Thuan province, some conclusions are as follows:

The development of the project in accordance with the natural conditions, social and development orientation of the province generates the following results:

- Environmental efficiency:

+ The project is environmentally friendly, does not emit greenhouse gases during operation;

+ The project does not affect the landscape and ecological environment of animals, as well as the general development planning in Bac Binh and Binh Thuan;

+ The project is in line with the Master Plan for Renewable Energy Development in the Central Region of Vietnam up to 2020 with the Ministry of Industry and Trade with the vision by 2030 and the Decision No. 2068/QD-TTg of the Prime Minister dated 25/5/ 2015. To approve the Vietnam's renewable energy development strategy up to 2030 with a vision to 2050.

+ The project does not cause noise to affect the surrounding area;

+ The project does not generate waste while operating;

+ High-tech project, automation operation process, multi-stage protection structure is difficult to occur.

+ The Project is operated without interference for communication means, radio waves....

- Economic efficiency:

Socio-economic benefits of the plant are shown:

To meet the regional demand for load growth;

Diversify electricity supply;

Increase local revenue;

Develop regional economy and create more jobs for local people;

The project participates in the process of ensuring energy security;

Exploitation of renewable energy sources, environmental protection, according to the strategy and program of renewable energy development of the Government.

Generation cost is avoidable: due to the economic project will reduce (avoided) investment in the amount of thermal power needed to install, and reduce the amount of fuel costs to generate electricity generated by the power project. the sun provides; Provide local power for the area to avoid remote transmission to.

The cost of health care is avoided: by reducing the amount of air pollution, the environmental pollution emitted by burning the fuel is avoided above;

The cost of avoiding global climate change (achieved by reducing emissions of harmful gases to the ozone layer)

The EIA report identifies and evaluates the impacts of the project preparation, construction and operation as follows: Identification and assessment of impacts on the air, soil, water and ecosystems in and around the project area. The report also predicts possible environmental incidents, as described in Chapter 3. The above-mentioned adverse effects are much milder if control and environment protection measures are taken.

In responding to the identification and assessment of the impact from the preparation, construction and operation of the project, the report sets out mitigation measures for environmental components and recommends all labor safety control, fire and explosion prevention and prevention of environmental incidents. These measures are highly feasible and have been applied in practice in similar projects. The project's negative impacts on the physical, chemical and biological environments can be entirely controlled by management and technical measures as described in Chapters 4 and 5 of the report.

Therefore, in order to control, minimize pollution and minimize the impacts of the project on the environment, from the time of construction to the time when the project is put into operation, measures and mitigation measures must be applied to prevent and respond to environmental incidents according to the plan already stated in the approved report on environmental impact assessment and the requirements stated in the decision approving the environmental impact assessment report.

2. RECOMMENDATIONS

Based on the environmental and social benefits, Hong Phong 1Energy JSC, the Employer of "*Hong Phong 1A solar power plant project with a capacity of 150MW*" is looking forward to receiving the cooperation and support from the relevant agencies and local authorities to facilitate implementation of the project as soon as possible.

3. COMMITMENTS

Hong Phong 1Energy JSC, the Employer of "*Hong Phong 1A solar power plant project with a capacity of 150MW*" hereby commits:

- Strictly comply with the Law on Environmental Protection.

- Strictly comply with the Law on Water Resources.
- The Decree No. 18/2015/NĐ-CP dated 14/02/2015 of the Government on environmental protection planning, strategic environmental impact assessment, environmental impact assessment and environmental protection plan
- The Decree No. 38/2015/NĐ-CP dated 24/4/2015 of the Government on waste and waste management.
- The Circular No. 36/2015/TT-BTNMT dated 30/06/2015 of the Ministry of Natural Resources and Environment regulates the management of hazardous waste.
- The Circular No. 27/2015/TT-BTNMT dated 29/05/2015 of the Ministry of Natural Resources and Environment on strategic environmental assessment, environmental impact assessment and environmental protection plan.
- To complete environmental treatment works before the projects are put into operation.

3.1. Commitments on environmental protection measures and measures to be implemented and completed during the project preparation and construction phase

Strictly implement measures in accordance with technical options to control the sources of pollution as described in the environmental impact assessment report. These impacts will be committed by the Employer as follows:

- Control dust and dust in the process of preparation and construction
- Overcome noise, vibration during the preparation and construction
- Manage wastewater from the process of preparation and construction
- Carry out technical safety measures in the process of capital construction
- Carry out measures on public security, traffic safety

3.2. Commitments on environmental protection measures and measures will be implemented during the period from the project's inception until the end of the project

Serious projects will be implemented to deal with environmental pollutants from project activities in accordance with technical options to control pollutants as stated in the EIA report. and the decision approving the environmental impact assessment report. Exhaust sources will be strictly controlled and concentrations of pollutants emitted into the environment will be discharged into the environment:

Control air pollution, noise, vibration

+ - QCVN 19: 2009/BTNMT (Class B, $K_p = 1$, $K_v = 0.8$) - National technical regulation on industrial emission of dust and inorganic substances.

- + QCVN 06: 2009/BTNMT - National technical regulation on some hazardous substances in ambient air.
- + Air quality meeting labor hygiene standards with Decision No. 3733/2002/QĐ-BYT dated October 10, 2002
- + Standards on noise and vibration: QCVN 26: 2010/BTNMT, QCVN 27: 2010/BTNMT.
- + QCVN 24: 2016/BYT - National Technical Regulation on noise - Contact level permits noise in the workplace.
- + QCVN 26: 2016/BYT - National Technical regulation on microclimatic climate - Microclimatic value at workplace.
- + QCVN 27: 2016/BYT - National Technical Regulation on vibration - Permissible value at work.

Control of electromagnetic field pollution

- QCVN 25: 2016/BYT: Electromagnetic Field Frequency Industries - Contact Levels allow for electromagnetic field frequencies in the workplace.
- Decree No. 14/2014/ND-CP dated 26/02/2014 of the Government detailing the implementation of the electricity law on electric safety.

Control wastewater pollution

- + The drainage system of rain and wastewater is designed to be separated completely.
- + Rainwater is collected into rainwater sewers arranged along the factory and delivered to the receiving source.
- + Domestic waste water is treated with septic tanks up to QCVN 14: 2008/BTNMT standard, then the source of receiving.

Collection and management of solid waste

Classifying, collecting, storing and transporting wastes of the plant under the guidance of the Government Decree No. 38/2015/ND-CP dated 24 April 2015 on the management of solid waste and scrap The Circular No. 36/2015/TT-BTNMT dated 30 June 2015 of the Ministry of Natural Resources and Environment on hazardous waste management and Joint Circular No. 58/2015/TTLT-BYT-BTNMT of the Ministry of Health and the Ministry of Finance Natural Resources and Environment dated 31/12/2015 regulating health care waste management.

Prevention of fire and explosion: To strictly take measures to prevent fire incidents, fire and explosion, occupational safety and hygiene and measures to prevent and combat such pollution incidents.

Comprehensive implementation of risk management measures for the project.

On environmental treatment and protection works: To ensure the timely construction of pollution treatment works (time limit for completion of pollution

treatment works: before the projects are put into operation. and officially inspected and certified by the competent agency before the project goes into operation.

On the implementation of local requirements: the Employer undertakes to absorb and implement the local requirements.

Monitoring program: as set out in Chapter 5 and the monitoring of environmental quality around the project area and timely measures for the monitoring results.

Environmental management: The Employer will coordinate with the relevant authorities in the design, construction and operation of pollution control systems to ensure compliance with environmental standards and regulations. To prevent environmental problems when they occur

3.3 Commitments on compensation and remediation of environmental pollution in case of incidents, environmental risks occurring due to project implementation

- Strictly apply measures to prevent environmental accidents: landslide, fire, explosion, labor safety, traffic safety ... in the preparation and construction phase as well as when the project enters. work.
- On labor safety: the Employer commits to comply with the current regulations on labor environment.
- In addition, the Employer is committed to ensuring order and security in the area, coordinate with local authorities in the management during the preparation and construction phase and when the project goes into operation.
- Commitment on compensation and remedy of environmental pollution in case of incidents and environmental risks occurring due to the implementation of the project.
- To take responsibility before law of the Socialist Republic of Vietnam for violating international conventions and/or Vietnamese standards if environmental incidents occur.

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APPENDIX