

### INTRODUCTION

OVERLOOK

Since we started our ESG path, in April 2022, we noticed that some companies had better performances than others when it comes to the quality and tenor of the works for construction of photovoltaic solar plants. Companies with better internal procedures tented to deliver the works sooner, provide us and the independent engineers with better disclosure of the projects and thus make the disbursement and monitoring process smoother.

To help the DG sector become more professionalized, together with Norsk Renewables, one of our invested companies, we decided to publish this handbook with the intent to turn it into a source of shared knowledge for entrepreneurs, investors and financial institutions. Brazil has a huge potential for the development of solar projects, and risk mitigation is a key factor for the growth of those kinds of projects.

Project Structure	Timeline	Description
Screening	1. Project Feasibility Analysis	1.1. Conduct comprehensive ESG (Environmental, Social) assessments to identify potential risks and opportunities. ESIA - Risk assessment - IFC PS Alignment
		1.2. Engage with local communities and stakeholders to understand social and environmental concerns. ESIA - CSR
		1.3. Evaluate governance structures to ensure alignment with sustainable practices and regulatory requirements. ESMS – ESAP
	2. Construction Site Mapping	2.1. Map out areas of ecological significance and cultural heritage to minimize impact during construction.
		2.2. Identify opportunities for habitat preservation and restoration to enhance biodiversity.
	3. Energy Distributor Statement	3.1. Ensure adherence to ESG standards and commitments by electricity distributors. By getting all the certificates, licences and authorizations
		3.2. Verify compliance with regulatory requirements and grid connection standards to promote sustainable energy distribution.
Project Development	1. Engineering and Construction Planning	1.1. Integrate ESG considerations into project design and planning processes.
		1.2. Conduct lifecycle assessments to minimize environmental impacts and enhance resource efficiency.
	2. Cost Evaluation	2.1 Include ESG factors in cost-benefit analyses to quantify social and environmental benefits and risks.
Structuring	1. Funding Process	1.1. Highlight ESG commitments and sustainable practices to attract socially responsible investors. (Expectation managment/ Townhalls
		1.2. Showcase social and environmental impacts to align with impact investment goals.
	2. Due Diligence of Main Stakeholders	2.1. Conduct thorough assessments of stakeholders' ESG performance and engagement. Stakeholders analyses and communication management
		2.2. Engage with stakeholders to address ESG concerns and foster transparent communication.
	3. Procurement Contracts	3.1. Integrate ESG criteria into procurement processes to prioritize sustainable suppliers and materials.
		3.2. Require subcontractors to adhere to ESG standards and commit to responsible practices. Focus in local content

Project Structure	Timeline	Description
Construction	1. HR Hiring Process & Training	1.1. Implement inclusive hiring process and provide training on ESG principles for all project personnel. Focus in local content
		1.2. Ensure diversity and equal opportunities in the workforce to promote social equity
	2. Equipment Rental Contracts	2.1. Select equipment suppliers based on ESG performance and commitment to sustainable practices
		2.2. Provide training on equipment operation and maintenance to minimize environmental impact and ensure safety
	3. Work Site Mobilization	3.1. Develop health, safety, and environmental protocols to protect workers and local communities
		3.2. Minimize environmental footprint through efficient logistics and waste management practices
	4. Vegetation Suppression	4.1. Utilize sustainable vegetation management techniques to minimize habitat disturbance and protect biodiversity
		4.2. Implement alternatives to chemical herbicides to reduce environmental pollution
	5. Earthmoving	5.1. Implement erosion control measures and monitor dust emissions to protect soil and air quality
		5.2. Promote responsible land use practices to minimize habitat loss and ecosystem disruption
	6. Supporting Structures	6.1. Ensure that supporting structures adhere to ESG standards and industry best practices to promote structural integrity and safety
		6.2. Conduct thorough inspections and quality checks to verify compliance with environmental regulations and sustainability criteria

Project Structure	Timeline	Description
Construction	7. Electromechanical Assembly	7.1. Implement ESG principles throughout the electromechanical assembly process to minimize environmental impact and promote resource efficiency
		7.2. Provide training on ESG practices for assembly workers to ensure adherence to sustainability standards and safety protocols
	8. BOS Integration	8.1. Integrate ESG considerations into BOS installation procedures to enhance efficiency and sustainability of solar PV systems
		8.2. Source materials and components from suppliers with strong ESG performance and commit to responsible manufacturing practices
	9. Power Substation Assembly	9.1. Adhere to ESG standards and regulatory requirements during the assembly of power substations to ensure reliability and safety of electrical infrastructure
		9.2. Implement measures to minimize environmental impact and protect surrounding ecosystems during construction and operation
	10. PV Plant Commissioning	10.1. Conduct commissioning activities in accordance with ESG principles and industry standards to ensure optimal performance and reliability of solar PV plants
		10.2. Verify compliance with environmental permits and regulations, and implement measures to mitigate potential risks and impacts
	11. HR Termination Process	11.1. Handle contract terminations ethically and transparently, considering social impacts and providing support services to affected employees
		11.2. Ensure compliance with labor laws and regulations to protect the rights and well-being of workers during the termination process

Project Structure	Timeline	Description
Operation & Maintenance	1. PV Modules Cleaning Process	1.1. Use environmentally friendly cleaning agents and adopt sustainable maintenance practices to optimize energy production
		1.2. Implement regular cleaning schedules to maximize efficiency and prolong equipment lifespan
	2. Drainage	2.1. Design and maintain drainage systems to prevent water pollution and minimize environmental impact
		2.2. Monitor drainage infrastructure for leaks and blockages to protect water resources and aquatic habitats
	3. Equipment Replacement	3.1. Implement proactive maintenance programs to minimize the need for frequent replacements and reduce waste
		3.2. Prioritize the use of durable and recyclable materials in equipment design to promote resource efficiency and circular economy principles
	4. Due Diligence & Subcontractors Hiring	4.1. Select subcontractors based on their ESG performance and commitment to responsible practices
		4.2. Ensure subcontractors adhere to ESG standards and contractual obligations to maintain project integrity and sustainability
	5. Surveillance & Security	5.1. Implement surveillance and security measures to protect assets, personnel, and data from physical and cyber threats
		5.2. Ensure compliance with ESG standards and regulatory requirements to mitigate risks and safeguard project reputation

Project Structure	Timeline	Description
Energy Commercialization	1. System Implementation	1.1. Consider social and environmental impacts of energy commercialization strategies, such as grid integration and tariff structures
		1.2. Implement sustainable energy solutions and practices to minimize environmental footprint and maximize societal benefits
	2. Finance & Accounting	2.1 Integrate ESG metrics into financial reporting and accounting practices to demonstrate commitment to sustainability and transparency
		2.2. Ensure compliance with ESG disclosure requirements and reporting standards to enhance credibility and stakeholder's trust
Decommissioning	1. Material Disposal	1.1. Develop decommissioning plans that prioritize environmentally responsible disposal and recycling of materials
		1.2. Identify opportunities for reuse and repurposing to minimize waste generation and promote resource conservation
	2. Recycling & Re-use	2.1. Partner with certified recycling facilities and salvage operators to responsibly dispose of decommissioned equipment and materials
		2.2. Implement circular economy principles to maximize resource recovery and minimize environmental impact during decommissioning processes



# SCREENING

### SCREENING

PROJECT STRUCTURE

- Identify risks and opportunities
- Engage local community
- Evaluate governance structures



### **PROJECT FEASIBILITY**

SCREENING

Impact:

Project feasibility analysis

Risk Type: Structural

Action: Meetings with Owner and EPC

Frequency: Daily

Responsible: Owner / EPC

Reversibility:

Impact:

Management Action:

Many companies had important challenges in the elaboration of the projects and discussion of those projects with EPCists. We highly recommend having a very close relationship with EPC contractors to avoid surprises.



### SCREENING

PROJECT STRUCTURE

- Minimize impact during construction
- Habitat preservation
- Enhance biodiversity



Project Feasibility Analysis

### Site Mapping

> Energy Distributor Statement

### SITE MAPPING

SCREENING

#### Impact:

Damage of Areas of Permanent Protection (APP) and native isolated trees

Risk Type: Biodiversity

Action: Review Project

Frequency: Once

Responsible: Owner

Reversibility:

Impact:

#### Management Action:

Clear demarcation of areas off limits for any project related activity. Fence around APP to be maintained. Install physical protection of native isolated trees to prevent damage from construction activities. The presence of fences and protection is very important.





### SCREENING

PROJECT STRUCTURE

- ESG standards adherence
- Regulatory compliance
- Licenses and authorizations

>> Project Feasibility Analysis

Site Mapping



Energy Distributor Statement

### ENERGY DISTRIBUTOR STATEMENT

#### SCREENING

#### Impact:

Project connection to distribution company

#### Management Action:

One of the main challenges for entrepreneurs is the delay in projects connection. We recommend that entrepreneurs pay very close attention to the **feasibility of the connection works and tenor**. Understanding the **steps required by the distribution companies** and getting to know the teams that are responsible is fundamental for the success of the projects.

Risk Type: Structural

Action: Meetings with Owner and EPC

Frequency: Daily

**Responsible:** Owner / EPC / DisCo

Reversibility:

Impact:



# PROJECT DEVELOPMENT

TIMELINE

![](_page_14_Picture_2.jpeg)

# **PROJECT DEVELOPMENT**

#### PROJECT STRUCTURE

- ESG design integration
- Enhance resource efficiency
- Minimize environmental impact

![](_page_15_Picture_6.jpeg)

### Cost Evaluation

### **CONSTRUCTION PLANNING**

#### PROJECT DEVELOPMENT

#### Impact:

Project site could be subject to potential risk of local flood hazards during the rainy season

#### Management Action:

Develop a **site-specific drainage plan** that identifies methods for containing and diverting rainwater runoff within the specific Project site considering site specific conditions (e.g. topography, rainfall, existing drainage lines, etc.). Due to recent events in Brazil and in the world that is crucial.

Risk Type: Geology, Hydrology and Hydrogeology

Action: Review Project

Frequency: Once

Responsible: Owner

Reversibility:

Impact: (

![](_page_16_Picture_12.jpeg)

# **PROJECT DEVELOPMENT**

#### PROJECT STRUCTURE

• Quantify social and environmental benefits and risks

![](_page_17_Picture_4.jpeg)

Construction Planning

![](_page_17_Picture_6.jpeg)

Cost Evaluation

### COST EVALUATION

#### PROJECT DEVELOPMENT

#### Impact:

- Road network transportation activities of the Project could affect level of service and capacity of existing roads as well as potential safety risks to users on the road
- (ii) Financial impact

#### Management Action:

- (i) Develop a Traffic and Transport Plan before commencement of any transportation activities to ensure that the transportation process is properly and adequately managed and does not pose a risk of damage to the existing roads or existing users on the road.
- (ii) Include ESG factors in cost-benefit analyses to quantify social and environmental benefits and risks.

Risk Type: (i) Infrastructure and Utilities; (ii) Financial

Action: Review Project

Frequency: Continuous

Responsible: Owner and EPC

Reversibility:

Impact:

![](_page_18_Picture_14.jpeg)

![](_page_19_Picture_0.jpeg)

STRUCTURING

### STRUCTURING

#### PROJECT STRUCTURE

- Attract socially responsible investors
- Townhalls
- Align impact investment goals

![](_page_20_Picture_6.jpeg)

### Funding Process

Due Diligence Stakeholders

![](_page_20_Picture_9.jpeg)

Procurement Contracts

### FUNDING PROCESS

#### STRUCTURING

#### Impact:

Impossibility do raise funding

#### Management Action:

Develop a comprehensive institutional presentation and a financial model that accurately reflects the project's reality. Ensure inclusion of crucial information such as shareholders' track record, project presentations, performance data, track record of stakeholders (EPC, offtakers, technical providers, distribution companies), connection works summary and dynamics, financial model assumptions, and detailed uses and sources of funds. Important to highlight all project benefits under every perspective: financial, economic, institutional, social, sustainable, among others.

Risk Type: Review Documentation

Action: Review Project

Frequency: Once

Responsible: Finance Team / Project Manager

Reversibility:

Impact:

![](_page_21_Figure_12.jpeg)

### STRUCTURING

#### PROJECT STRUCTURE

- ESG performance and engagement
- Management analysis
- Transparent communication

![](_page_22_Picture_6.jpeg)

![](_page_22_Picture_7.jpeg)

Due Diligence Stakeholders

Procurement Contracts

### DUE DILIGENCE STAKEHOLDERS

#### STRUCTURING

#### Impact:

Financial and Reputational Risk due to inadequate assessment of project stakeholders

#### Management Action:

Conduct a rigorous assessment of project stakeholders.

Run analysis over **credit bureau**, **compliance reports**, **esg due diligence**, **financial statements**, and the quality of performance bonds.

Perform background checks and get to know former clients to ensure reliability.

Ensure a robust Know Your Customer (KYC) process is in place.

![](_page_23_Figure_9.jpeg)

![](_page_23_Figure_10.jpeg)

## STRUCTURING

#### PROJECT STRUCTURE

- Prioritize sustainable suppliers and materials ٠
- ESG standards requirements ٠
- Focus in local content ٠

![](_page_24_Picture_6.jpeg)

![](_page_24_Picture_7.jpeg)

Due Diligence Stakeholders

![](_page_24_Picture_9.jpeg)

**Procurement Contracts** 

### **PROCUREMENT CONTRACTS**

#### STRUCTURING

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater

#### Management Action:

Hire private contractor for the collection of solid waste from the site to correct final waste disposal, for both non-hazardous and hazardous waste. Same for wastewater. Important to verify on a continuous basis until the end of the work. Our suggestion is to set a weekly data to make that check point.

Risk Type: Geology, Hydrology and Hydrogeology

Action: Inspection

Frequency: Weekly

Responsible: EPC

Reversibility:

Impact: (

![](_page_25_Picture_12.jpeg)

![](_page_26_Picture_0.jpeg)

# CONSTRUCTION

TIMELINE

# CONSTRUCTION

- Inclusive hiring practices ٠
- ESG principles training ٠
- Ensure diversity and equal opportunities ۰

![](_page_27_Picture_6.jpeg)

### HR Hiring & Training

![](_page_27_Picture_8.jpeg)

Equipment Rental

![](_page_27_Picture_10.jpeg)

Work Site Mobilization

![](_page_27_Picture_12.jpeg)

Vegetation Suppression

![](_page_27_Picture_14.jpeg)

Earthmoving

![](_page_27_Figure_16.jpeg)

Supporting Structures

#### CONSTRUCTION

#### Impact:

Visual and landscape impacts due to presence of elements typical of a construction site such as equipment and machinery

#### Management Action:

Ensure proper general housekeeping and personnel management measures are implemented which could include: (i) ensure the construction site is left in an orderly state at the end of each workday; ((ii) proper handling of waste streams, etc. Daily check must be presented.

Risk Type: Landscape and Visual Action: Training and Inspection Frequency: Daily Responsible: EPC Reversibility:

![](_page_28_Picture_7.jpeg)

#### CONSTRUCTION

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater

#### Management Action:

Prohibit dumping of any solid waste on the land, illegal disposal of wastewater, illegal disposal of hazardous waste.

Risk Type: Geology, Hydrology and Hydrogeology

Action: Training and Inspection

Frequency: Daily

Responsible: EPC

Reversibility:

Impact: (

![](_page_29_Picture_12.jpeg)

#### CONSTRUCTION

#### Impact:

Construction activities will likely result in an increased level of dust and particulate matter emissions which turn will directly impact ambient air quality the use of machinery and equipment such as generators, hammers and compressors and other activities.

Possible noise emissions to the environment from the construction activities which will likely.

#### Management Action:

Comply with the **Brazilian regulation** to ensure that for activities associated with high dust levels, workers are equipped with proper **Personal Protective Equipment**.

Apply basic dust control and suppression measures which could include: (i) regular watering of active construction areas; (ii) proper planning of dust causing activities; (iii) proper management of stockpiles and excavated; (iv) proper covering of trucks transporting aggregates and fine materials; and (v) adhering to a speed limit for trucks.

Risk Type: Air Quality and Noise

Action: Training and Inspection

Frequency: Continuous

Responsible: EPC

Reversibility:

Impact:

![](_page_30_Picture_14.jpeg)

#### CONSTRUCTION

#### Impact:

There will be generic risks to workers health and safety from working on construction sites, as it increases the risk of injury or death due to accidents

#### Management Action:

- (i) Prepare an Occupational Health and Safety Plan and adopt and implement its recommendations, ensuring working conditions are adapted for hot weather.
- (ii) Prepare a Worker Grievance Mechanism and implement its provisions.

#### **BUILDING A GRIEVANCE MECHANISM**

![](_page_31_Figure_8.jpeg)

Risk Type: Occupational, Health and Safety

Action: Submit Plan

Frequency: Continuous

Responsible: Owner

Reversibility:

Impact:

ΤΙΜΕΙΙΝΕ

# CONSTRUCTION

#### PROJECT STRUCTURE

- Commitment to sustainable practices
- Provide training
- Ensure safety

![](_page_32_Picture_6.jpeg)

### HR Hiring & Training

![](_page_32_Picture_8.jpeg)

### Equipment Rental

![](_page_32_Picture_10.jpeg)

Work Site Mobilization

![](_page_32_Picture_12.jpeg)

Vegetation Suppression

![](_page_32_Picture_14.jpeg)

Earthmoving

![](_page_32_Figure_16.jpeg)

Supporting Structures

### EQUIPMENT RENTAL

#### CONSTRUCTION

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.

#### Management Action:

**Incorporate dripping pans at machinery**, equipment, and areas that are prone to contamination by leakage of hazardous materials (such as oil, fuel, etc.).

Risk Type: Geology, Hydrology and Hydrogeology

Action: Review Contract

Frequency: Once

Responsible: EPC

Reversibility:

Impact: (

![](_page_33_Picture_12.jpeg)

# CONSTRUCTION

#### PROJECT STRUCTURE

- Health, safety and environmental protocols
- Efficient logistics
- Waste management practices

> HR Hiring & Training

![](_page_34_Picture_7.jpeg)

Equipment Rental

![](_page_34_Picture_9.jpeg)

Work Site Mobilization

![](_page_34_Picture_11.jpeg)

Vegetation Suppression

![](_page_34_Picture_13.jpeg)

Earthmoving

![](_page_34_Figure_15.jpeg)

Supporting Structures

### WORK SITE MOBILIZATION

#### CONSTRUCTION

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.

#### Management Action:

(i) Safe storage of hazardous and non-hazardous waste on site for all waste streams with recycling;

(ii) Maintain records and manifests that **indicate volume of waste-hazardous and non-hazardous-generated onsite**, collected by contractor, and disposed of at final disposal site. The numbers within the records are to be consistent to ensure no illegal dumping at the site or other areas

Risk Type: Geology, Hydrology and Hydrogeology

Action: Training and Inspection

Frequency: Daily

Responsible: EPC

Reversibility:

Impact: (

![](_page_35_Picture_13.jpeg)
### CONSTRUCTION

#### PROJECT STRUCTURE

- Minimize habitat disturbance
- Protect biodiversity
- Implement alternatives to Chemical herbicides
- Reduce environmental pollution





Equipment Rental



Work Site Mobilization



Vegetation Suppression



Earthmoving



Supporting Structures

### **VEGETATION SUPPRESSION**

CONSTRUCTION

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.

#### Management Action:

Return surfaces disturbed during construction to their original (or better) condition to the extent possible.

Risk Type: Geology, Hydrology and Hydrogeology

Action: Training and Inspection

Frequency: Continuous

Responsible: EPC

Reversibility:

Impact: (



## CONSTRUCTION

#### PROJECT STRUCTURE

- Erosion control measures ٠
- Monitor dust emissions •
- Protect soil and air quality ۰
- Promote responsible land use

HR Hiring & Training



Equipment Rental



Work Site Mobilization



Vegetation Suppression



Earthmoving



Supporting Structures

### EARTHMOVING

#### CONSTRUCTION

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.

#### Management Action:

Have a clear definition of the conditions permitted to do the work. Avoid executing excavation works under aggressive weather conditions. Erect erosion control barriers around work site during site preparation and construction of prevent silt runoff

Action: Training and Inspection Frequency: Continuous Responsible: EPC Reversibility:

**Risk Type:** Geology, Hydrology and Hydrogeology

Impact: (



## CONSTRUCTION

#### PROJECT STRUCTURE

- Structural integrity and safety ٠
- Quality checks •
- Compliance with environmental regulations ۰

HR Hiring & Training



Equipment Rental



Work Site Mobilization



Vegetation Suppression



Earthmoving



Supporting Structures

### SUPPORTING STRUCTURES

#### CONSTRUCTION

#### Impact:

Risk of structural failure or instability during the construction phase due to improper installation, material defects, or unforeseen geological issues.

#### Management Action:

**Ensure all structural components are inspected** and verified for quality before installation.

Use certified and experienced contractors for structural assembly.

Conduct regular inspections and load testing during and after construction.

Adopt technical parameters laid down for the activity

Risk Type: Structural

Action: Training and Inspection

Frequency: Weekly

Responsible: EPC

Reversibility:

Impact:



ΤΙΜΕΙΙΝΕ

## CONSTRUCTION

#### PROJECT STRUCTUR

- Promote resource efficiency
- Training for assembly Workers
- Implement safety protocols



### ELECTROMECHANICAL ASSEMBLY

CONSTRUCTION

#### Impact:

Risk of electrical hazards and accidents during the assembly of electromechanical components.

#### Management Action:

Implement strict **safety protocols** and ensure all personnel are trained in electrical safety.

Use lockout/tagout procedures to control hazardous energy.

Regularly inspect tools and equipment for safety compliance.

Risk Type: Occupational Health and Safety

Action: Safety Audits and Inspections

Frequency: Continuous

Responsible: EPC

Reversibility:

Impact:



## CONSTRUCTION

- Enhance efficiency and sustainability of solar systems ٠
- Responsible manufacturing practices •



Electromechanical Assembly



**BOS Integration** 



Power Substation Assembly



PV Plant Commissioning



HR Termination Process

### **BOS INTEGRATION**

#### CONSTRUCTION

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.

#### Management Action:

Place **clear markers** indicating stockpiling area of excavated materials to restrict equipment and personnel movement.

Risk Type: Geology, Hydrology and Hydrogeology

Action: Safety Audits and Inspections

Frequency: Continuous

Responsible: EPC

Reversibility:

Impact: (



### TIMELINE CONSTRUCTION

#### PROJECT STRUCTURE

- Ensure reliability and safety of electrical infrastructure ٠
- Protect surrounding ecosystem during construction •





BOS Integration



Power Substation Assembly



PV Plant Commissioning



HR Termination Process

### **POWER SUBSTATION ASSEMBLY**

CONSTRUCTION

#### Impact:

Risk of structural and electrical hazards during substation assembly due to complex integration of high-voltage equipment.

#### Management Action:

Employ a specialized company with a proven **track record** for substation assembly. Conduct detailed design reviews and risk assessments before commencement. Implement **rigorous testing** and commissioning procedures.

#### Risk Type: Structural

Action: Independent Third-Party Review

Frequency: Continuous

**Responsible:** EPC / Operator / Distribution

Reversibility:

Impact:



### CONSTRUCTION

#### PROJECT STRUCTUR

- Ensure optimal performance and reliability
- Implement measures to mitigate potential risks and impacts

>> Electromechanical Assembly



BOS Integration





PV Plant Commissioning



HR Termination Process

### **PV PLANT COMMISSIONING**

#### CONSTRUCTION

#### Impact:

Potential delays and operational issues if the project is not properly coordinated with EPC and Distribution Company. Management Action:

Assign a **dedicated site manager** with expertise in project coordination.

Ensure continuous communication and alignment between EPC and Distribution Company.

Establish a clear project timeline and milestones.

Risk Type: Reputational and Operational

Action: Project Milestone Reviews

Frequency: Monthly

**Responsible:** EPC / Operator

Reversibility:

Impact:



### **PV PLANT COMMISSIONING**

#### CONSTRUCTION

#### Impact:

Potential operational inefficiencies and system failures if the commissioning process is not thoroughly executed.

#### Management Action:

Develop a comprehensive commissioning plan that includes testing, validation, and performance verification.

Ensure all components are installed correctly and operating within specified parameters.

Conduct training for operational staff on new systems and protocols.

Risk Type: Operational Action: Commissioning Reports Frequency: Continuous Responsible: EPC / Operator

Reversibility:

Impact:



ΤΙΜΕΙΙΝΕ

## CONSTRUCTION

#### PROJECT STRUCTUR

- Ethics and transparency
- Provide support to affected employees
- Compliance with labor laws

>> Electromechanical Assembly

**)** BOS Integration

Power Substation Assembly



PV Plant Commissioning



HR Termination Process

### HR TERMINATION PROCESS

#### CONSTRUCTION

#### Impact:

Risk of legal disputes and reputational damage due to improper handling of contract terminations.

#### Management Action:

Ensure all contract terminations comply with local **labor laws** and contractual agreements.

Provide fair compensation and support for terminated employees.

Maintain clear and **transparent communication** with all stakeholders.

Risk Type: Reputational and Legal

Action: Legal Review and Compliance Check

Frequency: As Needed

Responsible: HR Department

Reversibility:

Impact: (



# OPERATION & MAINTAINANCE

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TIMELINE



### **OPERATION & MAINTAINANCE**

#### PROJECT STRUCTURE

- Environmentally friendly clearing agents
- Optimize energy production
- Prolong equipment lifespan



### PV Modules Cleaning

**)** Drainage



Equipment Replacement



Subcontractors



Surveillance & Security

### **PV MODULES CLEANING**

#### OPERATION & MAINTAINANCE

#### Impact:

Regular cleaning of PV modules is essential for maintaining optimal performance and efficiency.

#### Management Action:

Develop a **cleaning schedule** based on environmental conditions and manufacturer recommendations.

Use appropriate cleaning methods and materials to avoid damage to the modules.

Monitor the performance of the PV modules to determine the effectiveness of the cleaning process.

identify which other enterprises localized beside the project and which your business, for project the better date to cleaning. Priorate water re-use and local human resources.

Risk Type: Operational

Action: Performance Monitoring and Visual Inspection

Frequency: Continuous

Responsible: Operator

Reversibility:

Impact:



#### ΤΙΜΕΙΙΝΕ

## **OPERATION & MAINTAINANCE**

#### PROJECT STRUCTUR

- Prevent water pollution
- Monitor leaks and blockages
- Protect water resources

> PV Modules Cleaning

Drainage



Equipment Replacement



Subcontractors



Surveillance & Security

### DRAINAGE

#### OPERATION & MAINTAINANCE

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater Management Action:

- (i) No water accumulation must be presented on the site. Possibly contaminated water must be drained into appropriate facilities (such as sumps and pits)
- (ii) Segregate as hazardous waste: Contaminated drainage



Action: Inspection

Frequency: Daily

Responsible: Operator

Reversibility:

Impact: (



#### ΤΙΜΕΙΙΝΕ

## **OPERATION & MAINTAINANCE**

#### PROJECT STRUCTURE

- Minimize need for frequent replacements
- Reduce waste
- Circular economy principles

➢ PV Modules Cleaning

Drainage



Equipment Replacement



Subcontractors



Surveillance & Security

### EQUIPMENT REPLACEMENT

#### OPERATION & MAINTAINANCE

#### Impact:

Risk of soil and groundwater contamination during the various construction activities from improper housekeeping activities, spillage of hazardous material, random discharge of waste and wastewater.

#### Management Action:

(i) Segregate as hazardous waste: any damaged PV Panel

Risk Type: Geology, Hydrology and Hydrogeology

Action: Inspection

Frequency: Continuous

Responsible: Operator

Reversibility:

Impact: (



## **OPERATION & MAINTAINANCE**

#### PROJECT STRUCTURE

- ESG standards and performance
- Contractual obligations
- Maintain project integrity and sustainability

> PV Modules Cleaning

Drainage



Equipment Replacement



Subcontractors



Surveillance & Security

### SUBCONTRACTORS

#### OPERATION & MAINTAINANCE

#### Impact:

Construction activities could disturb wildlife, birds within the project site, as can improper conduct and littering.

#### Management Action:

Establishing **code of conduct** and awareness raising / training of personnel and good housekeeping (e.g. keeping the site orderly and clean).

Risk Type: Biodiversity Action: Training and Inspection Frequency: Daily Responsible: Operator

Reversibility:



### **OPERATION & MAINTAINANCE**

#### PROJECT STRUCTURE

- Protect assets, personnel and data
- Mitigate risks
- Safeguard project reputation

>> PV Modules Cleaning

🕥 Drainage





Subcontractors



Surveillance & Security

### SURVEILLANCE AND SECURITY

#### OPERATION & MAINTAINANCE

#### Impact:

There will be generic risks to workers health and safety from working on construction sites, as it increases the risk of injury or death due to accidents

#### Management Action:

Prepare an Emergency Preparedness and Response Plan and implement its provisions.

Risk Type: Occupational Health and Safety

Action: Submit Plan

Frequency: Continuous

Responsible: Owner

Reversibility:

Impact: (



### SURVEILLANCE AND SECURITY

#### OPERATION & MAINTAINANCE

#### Impact:

Forest fire hazards

Management Action:

All use of fire prohibited. Fire prevention and fighting to be included in Emergency Preparedness and Response.

Risk Type: Biodiversity Action: Emergency Response Frequency: Upon Occurrence Responsible: EPC and Operator Reversibility:



# ENERGY COMMERCIALIZATION

TIMELINE



ΤΙΜΕΙΙΝΕ

## **OPERATION & MAINTAINANCE**

#### PROJECT STRUCTURE

- Social and environmental strategies
- Maximize societal benefits



### SYSTEM IMPLEMENTATION

#### ENERGY COMMERCIALIZATION

#### Impact:

Challenges in implementing a robust billing system can disrupt financial operations and customer satisfaction.

Management Action:

Hire a specialized team to oversee the implementation of the billing system.
Conduct thorough testing and validation of the system before going live.
Provide training for staff to ensure smooth operation and troubleshooting.
Ensure general data protection law over the client base (e.g. LGPD)

Risk Type: Structural

Action: System Testing and User Feedback

Frequency: Periodic

Responsible: Operator

Reversibility:

Impact:



## **OPERATION & MAINTAINANCE**

#### PROJECT STRUCTURE

- Financial reporting and accounting practices
- Enhance credibility
- Stakeholder's trust



System Implementation



Finance & Accounting

### FINANCE & ACCOUNTING

#### ENERGY COMMERCIALIZATION

#### Impact:

Inefficient billing, finance, and accounting systems can lead to financial losses and operational inefficiencies.

#### Management Action:

Implement a comprehensive **financial management software** that integrates billing, finance, and accounting functions.

Regularly review financial processes and conduct audits to **ensure accuracy and compliance**.

Provide continuous training for finance and accounting staff.

#### Risk Type: Structural

Action: Financial Audits and Performance Reviews

Frequency: Quarterly

Responsible: Operator

Reversibility:

Impact:

#### **Financial Audit**





# DESCOMMISSIONING

### TIMELINE DECOMMISSIONING

#### PROJECT STRUCTURE

- Prioritize environmentally responsible disposal ٠
- Minimize waste Generation ٠
- Resource conservation •



Material Disposal



Recycling & Re-use
## MATERIAL DISPOSAL

#### DECOMMISSIONING

#### Impact:

Improper disposal of materials can lead to environmental contamination and damage to the company's reputation.

#### Management Action:

Ensure all materials are disposed of according to environmental regulations.

Implement a waste management plan that includes **recycling and proper disposal procedures**.

Regularly audit disposal processes to ensure compliance.



Risk Type: Environmental and Reputational

Action: Environmental Audits and Inspection

Frequency: Quarterly

**Responsible:** EPC / Environmental Manager

Reversibility:

Impact:

# DECOMMISSIONING

#### PROJECT STRUCTURE

- Partner with certified recycling facilities
- Responsibly dispose of equipment and material
- Circular economy principles





Recycling & Re-use

### **RECYCLING & RE-USE**

DECOMMISSIONING

#### Impact:

Failure to recycle or reuse materials can result in unnecessary waste and loss of resources, impacting both the environment and the company's reputation.

#### Management Action:

Develop a recycling and re-use plan that prioritizes the **use of recycled materials** where possible.

Partner with certified recycling facilities to ensure materials are properly processed.

Track and report recycling metrics to stakeholders.

Risk Type: Environmental and Reputational

Action: Environmental Audits and Inspection

Frequency: Continuous

**Responsible:** EPC / Environmental Manager / Operator

Reversibility:

Impact: (



#### SOURCE REDUCTION

## CONCLUSION

First, we would like to thank Norsk Renewables for the contribution in the creation and execution of this report. The knowledge shared was fundamental to achieve this result.

We hope that the information shared in this work will help your company, stakeholders and investors have a clearer understanding of the best practices that can be adopted to mitigate risks in the development, construction and execution of solar projects.

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