Executive Summary

EP4 Study- Climate Change Risk Assessment (CCRA)

450 MW Hybrid (Wind & Solar) Project, Rivdi, District Jaisalmer and Sheo, District Barmer, Rajasthan

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Prepared for:

Adani Solar Energy Jaisalmer One Private Limited (ASEJ1PL)

Prepared by:

Arcadis India Private Limited

Acronyms and Abbreviations

ASEJ1PL	Adani Solar Energy Jaisalmer One Private Limited
BSE	Bombay Stock Exchange
CCRA	Climate Change Risk Assessment
CMIP5	Coupled Model Intercomparison Project 5
CORDEX	Coordinated Regional Downscaling Experiment
EP	Equator Principles
TCFD	Task Force on Climate Related Financial Disclosure
PGCIL	Power Grid Corporation of India Limited
MAM	March April May
JJAS	June July August September
IMD	India Meteorological Department
RCP	Representative Concentration Pathway
RCM	Regional Climate Model
GFDL	Geophysical Fluid Dynamics Laboratory
ESM	Earth System Model
TC	Tropical Cyclone
CS	Cyclonic Storm
SCS	Severe Cyclonic Storm
NOAA	National Oceanic and Atmospheric Administration

Executive Summary

Adani Solar Energy Jaisalmer One Private Limited (proponent) is developing a Hybrid project of solar 421.9 MW and wind 105 MW in Jaisalmer and Barmer districts in the state of Rajasthan. The proponent has won the project through reverse auction conducted by SECI (Solar Energy Corporation of India Limited) on 5 Dec 2018 under the RFS floated by SECI on 22 June 2018 for setting up of ISTS (Inter State Transmission System) connected Solar Wind Hybrid Power Projects.

Arcadis India Private Limited (hereafter referred as Arcadis) was appointed by Adani Solar Energy Jaisalmer One Private Limited to undertake Climate Change Risk Assessment (CCRA) study to demonstrate compliance with the Equator Principles IV (EPIV). The CCRA is undertaken to assess the potential adverse effects from Global Warming and Climate Change. The scope of the CCRA has been defined using the Equator Principle's guidance note on climate change risk assessment. In line with that guidance, the scope of work is to include consideration of climate-related 'Physical Risks' as defined by the Task Force on Climate-Related Financial Disclosure (TCFD).

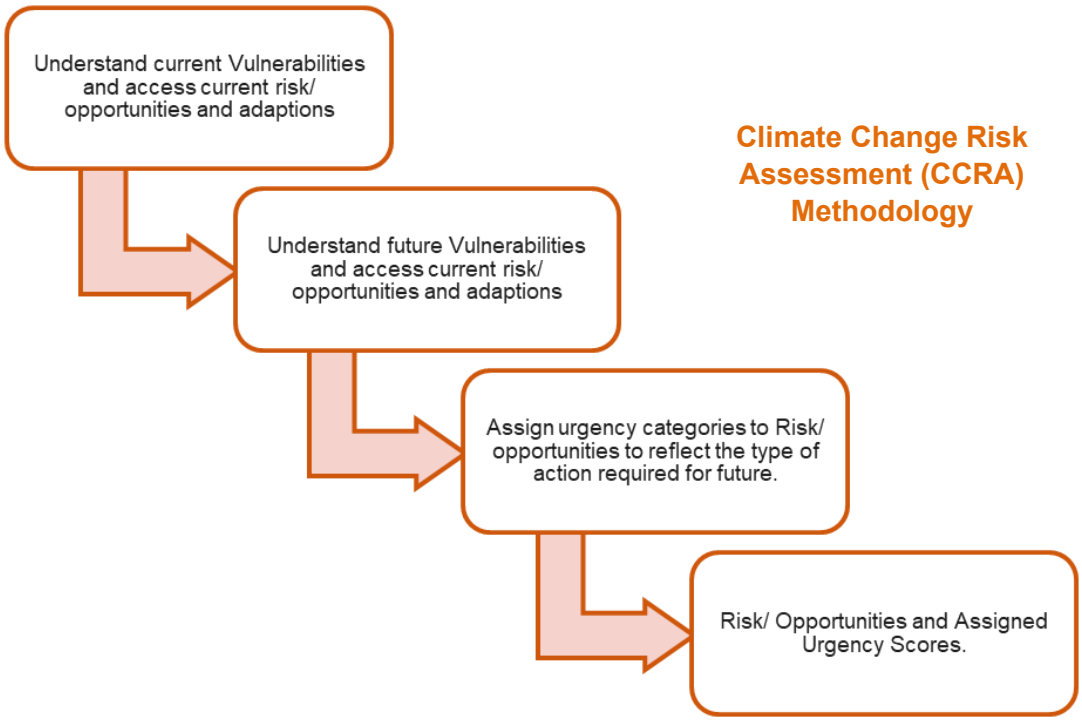
As per the studies, the project is estimated to reduce 960791.68 tCO_2 e/year based on combined energy, it will generate at P99 level of 1,216,192 MWh/year. The project with its limited data of 4 months shows negligible project emissions in comparison to emissions it is avoiding.

Scope and Methodology for Climate Change Risk Assessment (CCRA)

Climate Change Risk Assessment (CCRA) is conducted to access the exposure, sensitivity and adaptive capacity of the proposed project to the climate change risks and to study the interventions required to build resilience. The CCRA report present the natural hazards associated to the project site and associated climate change risk and vulnerabilities of the proposed hybrid power. Based on the study findings adaptive and mitigation measures are suggested in the report.

The key steps of the CCRA includes:

- An assessment of the baseline climate
- An assessment of future climate change projections for Jaisalmer, India
- Identification of climatic vulnerability of project components
- Qualitative assessment of the likelihood of climate impacts and severity of plausible climate impacts to the project to identify material risk
- A review of potential adaptation and resilience options
- Quantification & Reporting of project's GHG Emissions



Climate Hazard Assessment - Key Findings

The baseline hazards were evaluated based on the review of recognised global and national level open-source databases/literature. The hazards were categorised in categories such as No Hazard, Low, Medium, High, and No classification. The hazards were categorised based on the conservative normalisation of hazard categories available in the original data sets or based on the potential of the hazard to inflict damage on built and natural environment, and health and safety.

The likely changes in above hazards due to climate change were evaluated qualitatively for climate change scenarios of RCP 4.5 and RCP 8.5 during timeframes of 2030 and 2050, using CMIP-5 Climate Change Projections following the TCFD guidelines as recommended in EP-4. The likely changes in hazards are based on application of scientific principles, professional judgement and likely relation between natural hazards and the climate parameter.

Hazard	RCP 4.5		RCP 8.5	
	2030	2050	2030	2050
Extreme heat	**High**	**High**	**High**	**High**
Rainfall	**Negligible**	**Negligible**	**Negligible**	**Negligible**
Floods	**Negligible**	**Negligible**	**Negligible**	**Negligible**
Water Availability	**High**	**High**	**High**	**High**
Cyclone	**Low**	**Low**	**Low**	**Low**
Wind	**High**	**High**	**High**	**High**

The assessment indicated that water availability, extreme heat, and wind speed are likely to be 'High' hazard under baseline and climate change conditions. Flood and Cyclones indicated Low to Negligible hazard in the region. Following the evaluation of natural hazards under baseline and climate change conditions, general recommendations were provided on implications, available control measures and additional recommendations for each of the natural hazard are provided below.

Implications Analysis

Based on the future natural hazard, projects implications were evaluated for the solar and wind power plant, infrastructure and components. Along with this, preventive actions, management plans and adaptation measures were recommended which are provided below.

Transitional risk assessment based on TCFD

Risk Type	Potential Impacts	Risks mitigation
Policy and Legal Risks	• Stricter government mandates on climate action • Applicability of India's COP 26 • Commitments & Net Zero Targets	Not applicable to solar & wind hybrid projects as it is clean technology
	• Enhanced emissions-reporting obligations	Company may adopt ISO 14064 for GHG management, however in this hybrid project Scope 1 and 2 emissions is 37 tCO2e and Scope 2 is zero which however can be considered to be negligible.
	• Exposure to litigation	Not applicable to hybrid power projects as it is clean technology
Technology	• Early retirement of existing assets	Not applicable to hybrid power projects as it is clean technology
	• Costs of transition to lower emissions technology	Not applicable to hybrid power projects as it is clean technology
Market Risk	• Inability to increase market share	Not applicable to hybrid power projects as it is clean technology
Reputation Risk	• Conflict with community • Negative stakeholder feedback • Shareholder concerns	• Ensure periodic communication regarding the mitigation and adaptation measures adopted by the company. • Engagement and collaboration with stakeholders to discuss and resolve issues

Physical risk assessment based on TCFD

Risk Type	Potential Impacts	Risks mitigation/ Adaptation measures
Water Availability	• Impact on panel cleaning • Impact on domestic usage • Impact on cooling requirements	• Regular inspection for identification of water leakage and preventing water wastage; • Optimum use of water during sprinkling on roads for dust settlement, washing of vehicles, concrete mixer; • Construction labour deputed onsite to be sensitized about water conservation and encouraged for optimal use of water; • Recycle and reuse of water to the extent possible; and • Prepare and implement water conservation scheme e.g., rainwater harvesting at the project site.

Floods	• Damage to project infrastructure • Constraints on man and material movement	• The disaster management cell of the district should be involved in preparedness for emergency situation; • Company should ensure it has adequate third-party insurance cover to meet the financial loss to any third party due to such emergencies; • A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations. The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan.
Extreme Heat	• Damage to project infrastructure • Lower output from solar panels • Early degradation of plant components due to heat • Impact on human health • Increased fire risk	• The disaster management cell of the district should be involved in preparedness for emergency situation; • Company should ensure it has adequate third-party insurance cover to meet the financial loss to any third party due to such emergencies; • The workers (both regular and contractual) on the project will be provided with trainings on the Health and Safety policy in place, and their role in the same and refresher courses will be provided • A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations. The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan; and throughout the life of the project; • A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations. The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan.
Cyclone	• Damage to project infrastructure • Constraints on man and material movement	
Wind Speed	• Damage to project infrastructure • Constraints on man and material movement	• Revegetation of construction boundaries using fast growing local vegetation. This may help to mitigate impact of high wind speeds at low height and reduce impacts of low-lying structures and employees working in the open; • The workers (both regular and contractual) on the project will be provided with trainings on the Health and Safety policy in place, and their role in the same and refresher courses will be provided throughout the life of the project; • A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations. The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan; and • A safety or emergency management plan should be in place to account for natural disasters, accidents and any emergency situations. The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan.

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