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# Executive summary for TCFD report

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**Adani Green Energy Limited**

# Executive Summary for TCFD report

## Climate-related risks and opportunities aligned with TCFD guidelines

While climate change poses physical and transitional risks, it also creates opportunities for business to grow. For AGEL, identifying prospects for a transition to a low carbon economy involves monitoring the changing business landscape and markets.

As a part of AGEL's strategic and financial planning, we consider climate change to maximize value for customers, investors, stakeholders, and communities impacted by our operations. While strategic and financial planning, we consider both physical risks caused by the increased frequency and severity of climate and weather events, and transitional risks associated with economic, technology or regulatory changes.

As a part of our efforts to promote openness in addressing climate related risks and opportunities, we have implemented the recommendations of the Task Force on Climate-related Financial Disclosure (TCFD).

The TCFD Recommendations, launched in 2017, encourage companies to present their stakeholders with consistent and comparable information on climate-related risks and opportunities. The TCFD Recommendations are structured around four content pillars: (i) Governance; (ii) Strategy; (iii) Risk Management; and (iv) Metrics & Targets

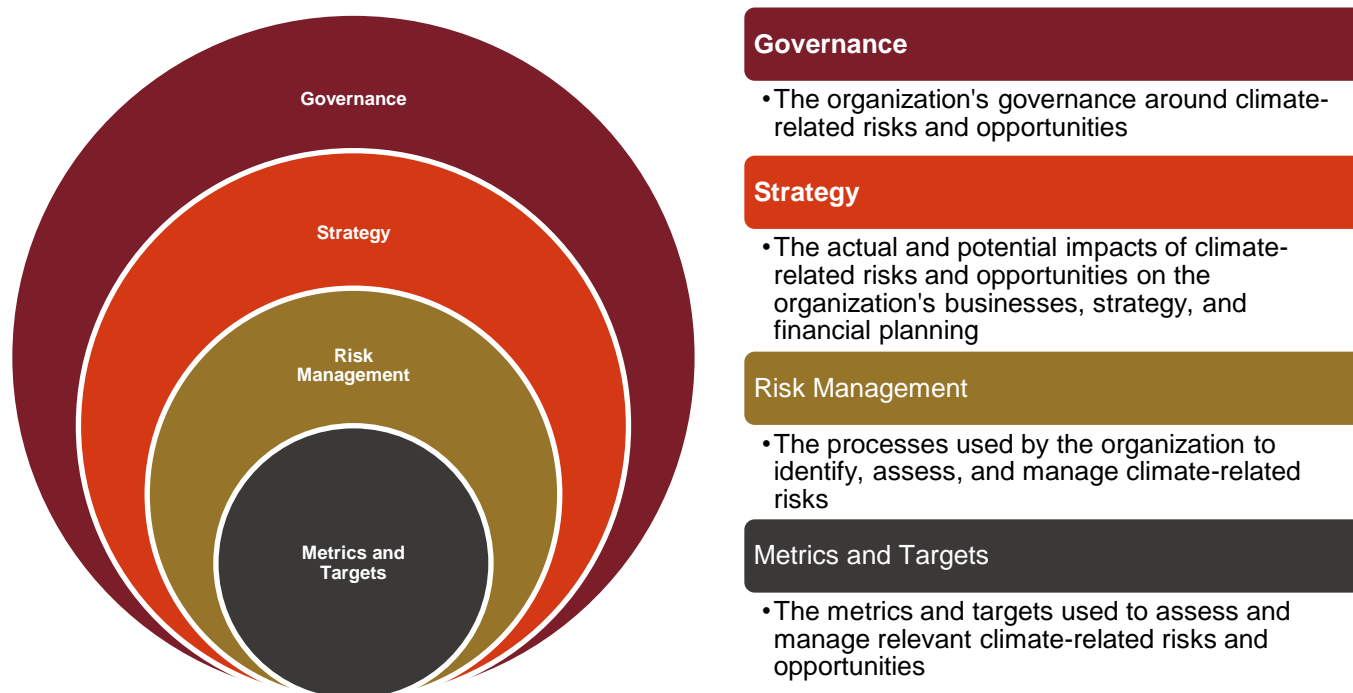


Figure 1: Core Elements of Task Force on Climate-Related Disclosure

## Governance

AGEL has established a robust governance framework to guide climate change and sustainability strategies. This facilitates effective implementation of sustainability-related initiatives, adequately addresses risks and opportunities, and ensures accountability.

## **Board's oversight of climate-related risks & opportunities**

Climate change and sustainability related aspects are etched into AGEL's core business strategy by the Board of Directors, overseeing climate-related risk and its associated impact on business.

AGEL's Board maintains active and ongoing oversight of the management of climate-related risks and opportunities through its board committees. It has delegated the primary responsibility related to the Company's sustainability initiatives to the Corporate Responsibility Committee (CRC) of the Board. The CRC reviews and approves AGEL's ESG strategy, including the climate-related strategy and is responsible for overseeing its implementation. Within this, oversight and effective management of climate-related risks and opportunities forms an important part of the committee's responsibilities. The CRC is the highest decision-making body when it comes to ESG stewardship, including climate-related projects and initiatives. The Risk Management Committee (RMC) of the Board reviews and approves the Company's overall risk governance structure, risk assessment and risk management policies, practices and guidelines and procedures, including the risk management plan, which also include climate change related aspects.

At the Board level, the Managing Director (MD), as a permanent invitee of the Corporate Responsibility Committee (CRC), is responsible for managing climate-related risks & opportunities. The Board is ably supported by other board committees such as Audit Committee, Nomination & Remuneration Committee, CSR Committee, Stakeholders' Relationship Committee, Mergers & Acquisitions Committee, Legal, Regulatory & Tax Committee, Reputation Risk Committee and Information Technology and Data Security Committee.

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*The Board receives updates on climate related risks & opportunities including mitigation controls on a quarterly basis from the Corporate Responsibility Committee and Risk Management Committee.*

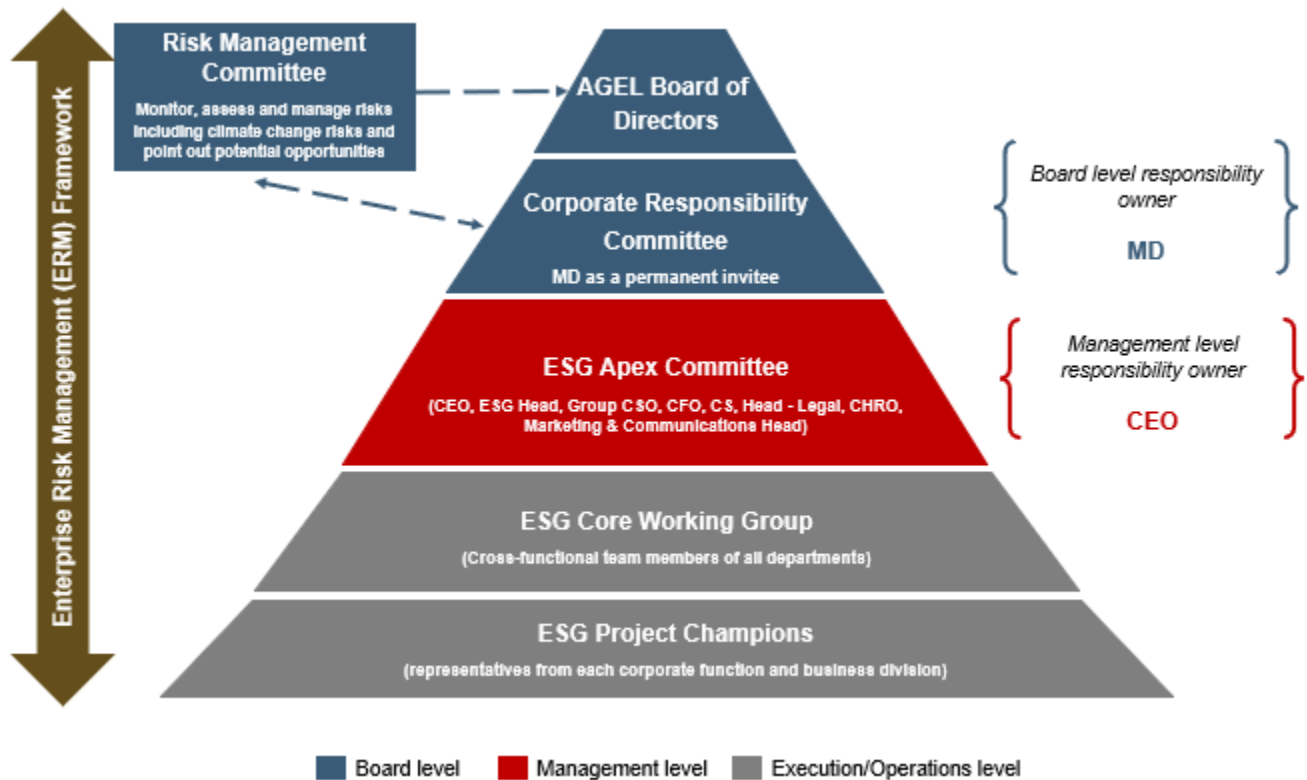
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The CRC and RMC hold meetings on a quarterly basis. While the CRC oversees strategies, activities, and policies regarding sustainable organization and ESG risks (including climate-related risks), the RMC ensures that appropriate methodology, processes, and systems are in place to identify, monitor, evaluate and mitigate climate related risks. The CRC and RMC receive updates on the progress of the company's management of climate related risks and opportunities throughout the year. This structure ensures that, at least on a quarterly basis, these Board committees identify, analyse, and monitor climate risks and opportunities in alignment with TCFD and tailor the mitigation plans accordingly.

The Chief Risk Officer (CRO) is the owner of the Enterprise Risk Management (ERM) and oversees the disposition of it on the management front and interacts with the Risk Management Committee (RMC).

## **Management's role in assessing and managing climate-related risks & opportunities.**

At the management level, Company's Chief Executive Officer (CEO), as the Chairman of the ESG Apex Committee, is responsible for managing climate-related risks and opportunities. The ESG Apex Committee, which reports to the Corporate Responsibility Committee (CRC) and Risk Management Committee (RMC), evaluates operations and practices for improvement possibilities with regard to climate change management. This committee provides direction to the ESG program, approves ESG disclosures (annual report, sustainability report and special disclosures), allocates ESG Core Working Group resources and implements the ESG strategy, including management of climate related risks and opportunities.



ESG criteria relevant to their department forms a part of the Key Result Areas (KRAs) of our Executive management. This allows for better management of the ESG criteria as the assessment based on KRAs is linked to the remuneration of the respective executives. This further drills down to the business unit managers and then to the employees. The KRAs include GHG emissions reduction, energy reduction and efficiency, sustainable sourcing and supply chain engagement, climate change risk mitigation, human capital development, occupational health and safety, etc.

## Strategy

In line with the TCFD recommendations, AGEL has carried out a comprehensive risk assessment review to identify climate-related physical and transition risks across different time horizons.

TCFD category	Risk type	Risk description	Time Horizon <sup>1</sup>
Physical Risks	Acute	Flood (coastal, fluvial, pluvial)	Short-term
		Cyclone	Short-term
		Wildfire	Medium-term
	Chronic	Temperature extremes	Long-Term

<sup>1</sup> Short Term (0-3 years); Medium Term (4-10 years); Long Terms (10-25 years & beyond)

TCFD category	Risk type	Risk description	Time Horizon <sup>1</sup>
Transitional Risks	Policy and regulation	Disposal of solar panel waste	Long-Term

To avoid adverse effects of climate related risks and opportunities, AGEL has developed a robust risk mitigation strategy to manage both physical and transitional risks.

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*Our robust risk management strategy ensures that our infrastructure and business remain resilient to climate related changes in future*

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AGEL has considered climate related risks and opportunities in financial planning. Additionally, we use Internal Carbon Pricing (ICP) in financial analysis to pursue projects that would have otherwise been unfeasible due to a lower internal rate of return and a longer payback period.

### Scenario Analysis

Climate-related scenarios allow AGEL build up understanding of how climate-related physical and transition risks might plausibly impact the businesses over the time by evaluating a range of hypothetical outcomes by considering a variety of alternative plausible future states (scenarios) under a given set of assumptions and constraints.

For **physical risks**, we have considered the latest set of scenarios released & mentioned in IPCC AR6 (6<sup>th</sup> Assessment report) released in 2021. These are known as Shared Socioeconomic Pathways (SSPs). SSPs are scenarios which are extension of RCPs (Representative Concentration Pathways) and are projected socioeconomic global changes up to 2100. We have quantified the financial impacts of various physical risks under different SSP scenarios till 2050.

AGEL has undertaken a detailed site-wise climate risk assessment of various physical risks under different IPCC scenarios. The climate risk assessment exercise considered the risks associated with Coastal flooding, Drought, Fluvial flooding, Pluvial flooding, Temperature extremes, Tropical cyclones, Water stress, and Wildfire. These risks were assessed under scenarios - SSP1-2.6, SSP2-4.5 and SSP5-8.5.<sup>2</sup>

SSP	Scenario (Likelihood)	Estimated warming (2021–2040) Near term	Estimated warming (2041–2060) Mid Term	Estimated warming (2081–2100) Long Term	Very likely range in °C (2081–2100)
SSP1-1.9	Very low GHG emissions: CO <sub>2</sub> emissions cut to net zero around 2050	1.5 °C	1.6 °C	1.4 °C	1.0 – 1.8

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<sup>2</sup> The physical risk modelling till 2050 using these scenarios was done using Climonomics Platform by S&P Global

SSP	Scenario (Likelihood)	Estimated warming (2021–2040) Near term	Estimated warming (2041–2060) Mid Term	Estimated warming (2081–2100) Long Term	Very likely range in °C (2081–2100)
<b>SSP1-2.6</b>	Low GHG emissions: CO <sub>2</sub> emissions cut to net zero around 2075	1.5 °C	1.7 °C	1.8 °C	1.3 – 2.4
<b>SSP2-4.5</b>	Intermediate GHG emissions (likely): CO <sub>2</sub> emissions around current levels until 2050, then falling but not reaching net zero by 2100	1.5 °C	2.0 °C	2.7 °C	2.1 – 3.5
<b>SSP3-7.0</b>	High GHG emissions (unlikely): CO <sub>2</sub> emissions double by 2100	1.5 °C	2.1 °C	3.6 °C	2.8 – 4.6
<b>SSP5-8.5</b>	Very high GHG emissions (highly unlikely): CO <sub>2</sub> emissions triple by 2075	1.6 °C	2.4 °C	4.4 °C	3.3 – 5.7

AGEL has conducted a geography wise assessment of its sites for acute and chronic physical risks

Following is the summary of findings for physical risk analysis

Impact as a percentage of revenue									
Physical Risk	SSP 2.6			SSP 4.5			SSP 8.5		
	2020-2029	2030-2039	2040-2049	2020-2029	2030-2039	2040-2049	2020-2029	2030-2039	2040-2049
Fluvial Flooding									
Pluvial Flooding									
Temperature Extremes									
Tropical Cyclone									
Wildfire									
Drought	No risk	No risk	No risk	No risk	No risk	No risk	No risk	No risk	No risk
Water Stress	No risk	No risk	No risk	No risk	No risk	No risk	No risk	No risk	No risk

**Potential financial impact level**

Marginal  
<1% of revenue

Moderate  
1% - 2% of revenue

High  
2% - 3% of revenue

Critical  
3% - 4% of revenue

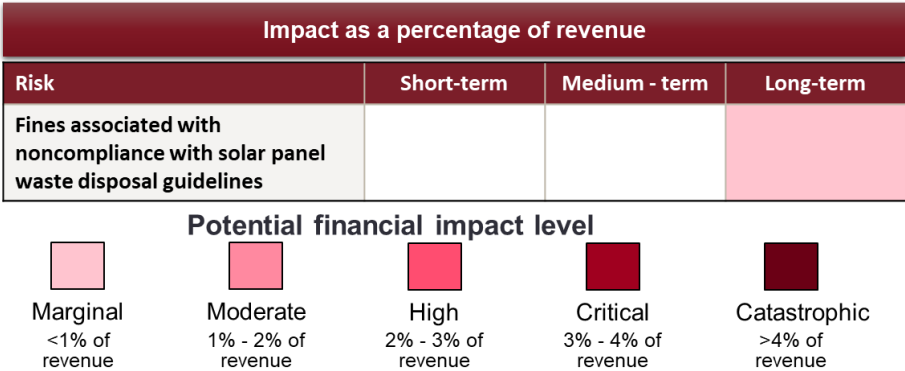
Catastrophic  
>4% of revenue

The analysis indicates that our plants do not face any risk due to drought and water stress. These findings are in alignment with qualitative research studies which assert that solar PV and wind turbines are the solution for a more drought resilient and water stress resilient energy sector (He et al. 2019<sup>3</sup>, Scanlon et al. 2013<sup>4</sup>, Zamuda et al. 2013<sup>5</sup>). Our existing plans for implementing robotic cleaning will help us in improving the resiliency of our assets further. With installation of robotic cleaning, our water requirements have reduced drastically and with plans of expanding robotic cleaning further, we will not have major dependency on water. Thus, drought and water stress do not pose a major risk to our business. The findings from the climate risk assessment exercise have been used further to strengthen our risk management strategies.

In addition to the risks analysed through scenario analysis, AGEL also acknowledges the impact of changes in wind speeds and solar irradiation on generation output. Studies indicate that India has experienced 0.77 PWh (approx.. 13%) reduction in the potential for wind power generation per decade during 1980–2016.<sup>6</sup> Furthermore, studies also indicate that in India radiation is expected to decrease until 2049 with annual reductions up to 0.5%<sup>7, 8</sup>

For **transitional risks**, a bespoke scenario in line with our aspirations of achieving net zero by 2050 is considered. The possible impact of evolving solar panel waste management policies has been considered in order to assess the company’s resilience and compliance with policy mechanisms in the near future.

Following is the summary of findings for transition risk analysis



Since our operations pertain to 100 per cent renewable energy generation, we do not envisage any policy/regulatory risks arising from emissions due to our own operations. We have also analyzed our emission trajectory as per IEA NZE (Net Zero Emissions Scenario by International Energy Agency ) scenario.

<sup>3</sup> He, Xiaogang, et al. “Solar and Wind Energy Enhances Drought Resilience and Groundwater Sustainability.” Nature Communications, vol. 10, no. 1, 6 Nov. 2019, 10.1038/s41467-019-12810-5. Accessed 12 Nov. 2019

<sup>4</sup> Scanlon, Bridget R, et al. “Drought and the Water–Energy Nexus in Texas.” Environmental Research Letters, vol. 8, no. 4, 1 Dec. 2013, p. 045033, 10.1088/1748-9326/8/4/045033.

<sup>5</sup> Zamuda, Craig, et al. U.S. Energy Sector Vulnerabilities to Climate Change and Extreme Weather. U.S. Department of Energy, July 2013

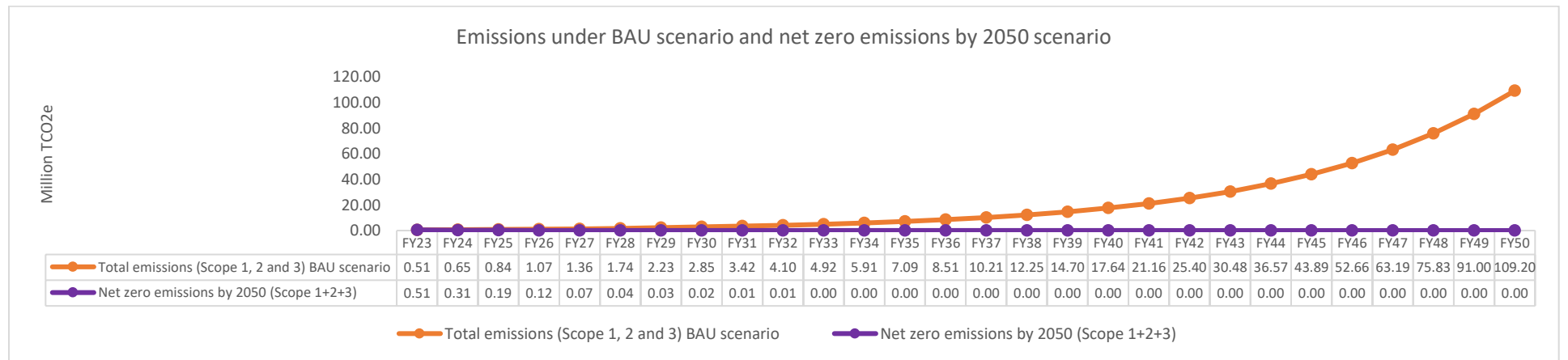
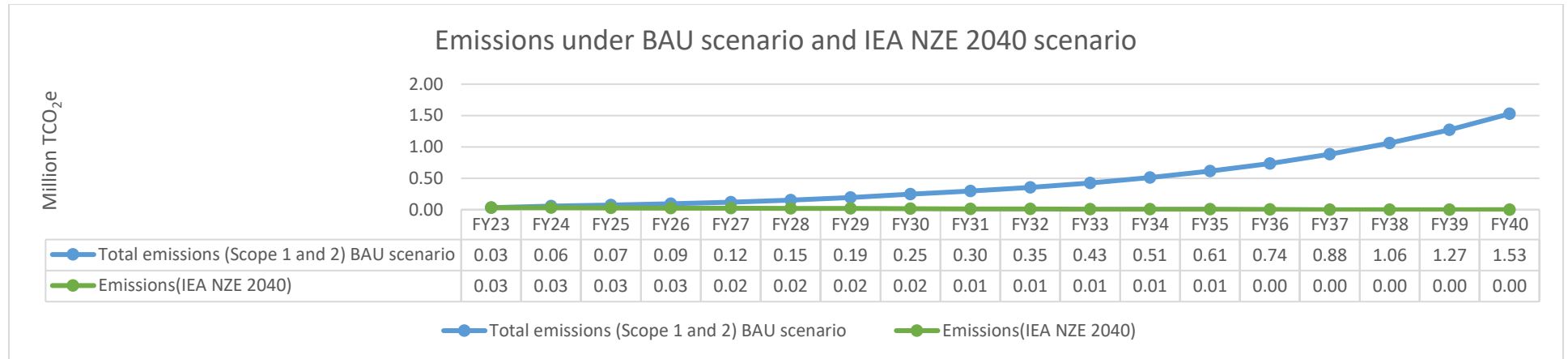
<sup>6</sup> <https://www.science.org/doi/10.1126/sciadv.aat5256>

<sup>7</sup> <https://www.sciencedirect.com/science/article/abs/pii/S0038092X15001668>

<sup>8</sup> <https://www.sciencedirect.com/science/article/pii/S1364032119306239>

## Scenario analysis – Transition risks

AGEL has carried out scenario analysis for assessing the impact of transitional risks on its business so that proactive measures can be undertaken in high-risk areas to ensure uninterrupted business functioning in the short, medium, and long run. This analysis has been done till period of 2050 i.e. aligned with 1.5° C





## Opportunities

While AGEL has implemented an effective climate change strategy and governance framework, we believe that the future encompasses several opportunities in low carbon transition. AGEL has identified the following opportunities with respect to climate change:

Type	Climate –Related Opportunity
Development and/or expansion of low emission goods and services	<p>India has target to increase its non-fossil energy capacity to 500 GW by 2030 and India’s updated NDCs target achieving 50% of cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030. The increased focus on renewable energy expansion is in alignment with AGEL's business model serving B2B customers State utilities &amp; Distribution Companies (DISCOMS). AGEL has tie up with the DISCOMS to offtake the generated power through long term Power Purchase Agreements (PPAs).</p> <p>Our business expansion plans are in alignment with the national targets which will further provide us opportunities to increase our market share.</p>
Reduced water usage and consumption	<p>Recognizing importance of water as a critical and scarce and shared resource, AGEL is committed to become net water neutral by implementing semi-automatic module cleaning and water- free robotic cleaning systems at solar plants. This helps to address the challenges associated with limited water availability while addressing the problem of dust accumulation on solar modules. Use of mix of water and compressed air semi-automatic module cleaning system can help in moderating water usage and costs. Use of water free robotic technology is also cost-effective.</p>
Use of more efficient modes of transport	<p>AGEL has Signed for EV 65 pledge in Dec 2021 with plan to reach total 65% electric vehicles in its fleet by 2030. This ambitious initiative will not only revolutionize our transportation practices but also lead to a substantial reduction in carbon emissions, effectively decarbonizing our transport footprint. By embracing electric mobility, AGEL will significantly reduce greenhouse gas emissions, contributing to a cleaner and greener future.</p>
Increased Penetration in carbon markets	<p>With Indian carbon market launched recently by Gol, the voluntary carbon market is expected to grow multifold, providing an opportunity to offset emissions beyond AGEL's value chain. By generating clean energy, AGEL can earn carbon credits that can be sold, providing an additional revenue stream. Moreover, the market incentivizes us to further invest in renewable energy projects, accelerating the transition to a low-carbon economy and fostering sustainable growth.</p>

Following is the summary of financial impact of opportunities identified

S. No	Opportunity Category	Description	Magnitude of Impact
1	Resource Efficiency	Reduced water usage and consumption	Low: 1-2% of annual revenue
2	Resource Efficiency	Use of more efficient modes of transport	Very low: <1% of annual revenue
3	Energy source	Participation in carbon market	High: 3-4% of annual revenue
4	Products and services	Development and/or expansion of low emission goods and services	High: 3-4% of annual revenue

	Very high: >4% of annual revenue		High: 3-4% of annual revenue		Medium: 2-3% of annual revenue		Low: 1-2% of annual revenue		Very low: <1% of annual revenue
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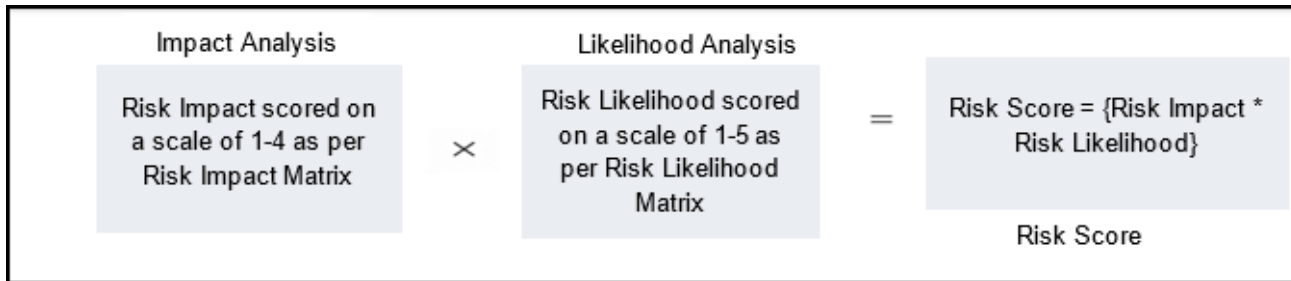
## Risk management

AGEL has a well- defined risk management framework. Climate change-related risks are identified, assessed, managed, and monitored using a multidisciplinary company-wide risk management strategy which is then integrated in organizations’ overall Enterprise Risk Management (ERM) framework.

The **risk identification** process at AGEL starts with the identification of sources of risk, areas of impact events (including emerging trends) and their causes and their potential consequences, on the achievement of business objectives.



Next step is **risk analysis** where the level of exposure to each of these risks is analysed based on the sources of risk, likelihood of occurrence, causal-effect scenarios, potential mitigation strategies and effectiveness of these strategies. This is followed by a **risk assessment and prioritization** process which involves evaluating and assessing the potential impact and likelihood of occurrence of the identified risks. The analyzed risks are rated based on the severity score and nature of impact.



		Risk Severity			
		Marginal 1	Moderate 2	Critical 3	Catastrophic 4
Risk Frequency	Frequent 5	Medium 5	High 10	High 15	High 20
	Probable 4	Medium 4	Serious 8	High 12	High 16
	Occasional 3	Low 3	Medium 6	Serious 9	High 12
	Remote 2	Low 2	Medium 4	Medium 6	High 8
	Improbable 1	Low 1	Low 2	Low 3	High 4

The **risk mitigation** strategies are planned for each priority on the desired risk outcomes. This is followed by **risk treatment** which are dealt through mitigation plans developed towards reducing the probability of occurrence or the impact of risk event. Thereafter, **risk monitoring and reporting** involves defining frequency for monitoring the status of risks to track them periodically. Finally, **risk reviewing** is undertaken wherein, by defining definite review forums, frequency of reviews is defined to ensure that key risks at the Company level are reviewed, together with review of progress of mitigation plans.

### Risk Mitigation

In order to address **physical risks**, AGEL has identified adaptive measures against each physical risk (floods, cyclone, temperature extremes, wildfire etc.) for all our existing sites. Please refer to Annexure 1 for further details on mitigation strategies adopted by AGEL. We have also developed SOPs for conducting climate risk assessments for our future/upcoming sites.

Future strategies will be developed based on findings from risk assessment exercise. This will ensure that climate risks and associated mitigation measures and adaptation strategies are incorporated into the design process at the very beginning.

Furthermore, we are also implementing an emergency response plan for each of our sites to ensure that they are protected from threats and costly repairs.

With regards to transitional risk, AGEL ensures compliance with evolving regulations and guidelines on responsible management of solar panel waste. We have also developed an end-of-life management plan, identifying authorized recycling facilities, maintaining documentation of the disposal process, training employees, conducting internal audits, monitoring waste management partners, reporting on waste practices, engaging in industry initiatives, and regularly improving waste management practices.

## Targets and metrics

AGEL has committed to become a net zero carbon company by 2050 and has a well-defined roadmap and strategy in place to attain this goal.

AGEL is water-positive for all operating plants above 200MW capacity, single-use-plastic-free and zero-waste-to-landfill-certified that is ahead of its FY25 target. We started a zero waste to landfill initiative and during FY 2022-2023 got 'Zero Waste to Landfill (ZWL)' certification by achieving a diversion of more than 99% of waste away from landfills. We were also certified as Single-use-Plastic-Free (SuPF) for all operational sites in FY22. We became 'water positive'-certified for all operating plants with more than 200 MW capacity.

Additionally Adani Group has pledged to plant 100 million trees by 2030. AGEL would contribute to this by planting 27.86 Lakh trees by 2030.

### Key Metrics

AGEL assesses, monitors, and optimizes its scope 1, 2 and 3 emissions periodically. Since AGEL operates in the renewable energy sector which itself is an enabler for decarbonization, it is not exposed to GHG emission reduction targets mandated by policy and regulatory interventions. Furthermore, AGEL's commitment towards net zero carbon emissions by 2050 drives the emission reduction initiatives in the organization

GHG Emission	FY 21	FY 22	FY23
Scope 1 Emission (Metric tCO <sub>2</sub> /year)	1,317	1,272	711.11
Scope 2 Emission (Metric tCO <sub>2</sub> /year)	14,6561	30,535	31,888
Scope 3 Emission (Metric tCO <sub>2</sub> /year)	319,236	1,440,827	480,199

### Strategic Goals

Besides targets for reducing GHG emissions, AGEL has also taken following targets for near-term and long term:

- To develop and operate renewable energy capacity of 45 GW by 2030
- To be Single-use-Plastic-Free (SuPF) company. Already achieved this in 2023.
- To be Zero-Waste-to-Landfill (ZWL) company. Already achieved this in 2023.
- To be Net Water Neutral for plants more than 200 MW
- To achieve No Net Loss of biodiversity by FY25
- To plant 27.86 Lakh trees by 2030
- To engage all critical and manufacturing suppliers through Suppliers' Engagement Programme for the decarbonization of the value chain
- Significant electric vehicles transition by 2030 (EV 65): The EV65 initiative sets a target for AGEL to achieve a total of 65% electric vehicles in its fleet by 2030. By transitioning to electric vehicles, the

initiative aims to significantly reduce carbon emissions and contribute to decarbonizing the transport footprint, promoting sustainability in the company's operations.

## **Internal Carbon Pricing**

AGEL uses Internal Carbon Pricing (ICP) as an important enabler for decarbonization. AGEL has implemented the ICP through a shadow pricing mechanism. This innovative approach is set to play a pivotal role in assessing and managing climate-related risks, while also identifying and harnessing climate-related opportunities for the Company.

The shadow ICP has enabled us to pursue projects resulting in the reduction of carbon emissions that were initially not feasible due to a lower internal rate of return and a longer payback period. The company's ICP has paved the way for the development of low carbon projects. AGEL has determined the carbon price in the range of USD20-USD30 per ton of CO<sub>2</sub>.

This price is based on three key factors:

- Cost of offsets
- Cost of Renewable Energy Certificates (RECs)
- Carbon pricing scenario outlined by the Network for Greening the Financial System (NGFS)

ICP will help us make more informed decisions about investments and operations, ensuring that we are taking a holistic approach to climate action.

# Annexure 1: Mitigation measures

AGEL has a disaster management plan in place which guides the safety and emergency management actions to account for climate risk events, natural disasters, accidents, and any emergency situations. Following are climate risk specific mitigation measures considered in our risk management strategy.

## Mitigation Strategy for acute physical risks

Risk description	Risk mitigation strategy
<p><b>Flood (coastal, fluvial, pluvial)</b></p>	<ul style="list-style-type: none"> <li>• Developing an emergency response plan specific to fluvial and pluvial flooding events, specifically outlining evacuation procedures, equipment shutdown protocols, and coordination with emergency services to ensure the safety of personnel and minimize damage.</li> <li>• Conducting thorough site evaluations and choosing locations that are less prone to fluvial and pluvial flooding while setting up new plants.</li> <li>• Performing flood modelling and risk assessments to understand the potential flood levels and their impacts on the plant and designing appropriate mitigation measures.</li> <li>• Implementing regular maintenance schedules to inspect and address any potential issues that may increase vulnerability to flooding and help identify and rectify drainage or infrastructure problems in a timely manner.</li> <li>• Implementing flood protection infrastructure, such as flood barriers, levees, or embankments, to redirect or floodwaters and shield the plant from floodwaters thus reducing the risk of damage.</li> <li>• Ensuring that foundations and support structures are designed to withstand flood forces.</li> <li>• Ensuring proper earthing at sites as per IS-3043 and lighting arrestor as per IS 3070-3</li> <li>• Installing solar panels, electrical equipment, and critical infrastructure at an elevated position above the anticipated flood levels to protect the equipment from water damage and allowing for quicker recovery after a flood event.</li> <li>• Designing the plant site with appropriate elevation and grading to facilitate proper drainage and minimize the accumulation of water while ensuring that the site is properly sloped to allow water to flow away from critical infrastructure.</li> <li>• Applying waterproofing measures to electrical connections, equipment enclosures, and control rooms to prevent water infiltration during flooding. Proper sealing and insulation can help protect the electrical components from damage.</li> <li>• Ensuring that solar panels, support structures, wind turbine foundations and anchoring systems are securely mounted and designed to withstand the forces exerted by floodwaters. This helps prevent dislodging or displacement of panels and toppling of turbines during floods.</li> <li>• Implementing effective stormwater management systems, including proper drainage systems, swales, ditches, and retention ponds, to capture and channel excess rainwater away from the plant site.</li> <li>• Installing flood monitoring systems that include water level sensors and real-time monitoring capabilities to provide early warning alerts and allow for timely response and evacuation, if necessary.</li> </ul>

Risk description	Risk mitigation strategy
	<ul style="list-style-type: none"> <li>• Installing backup power systems, such as generators or energy storage, to provide electricity during and after flood events. Redundancy in critical systems can help maintain power supply and enable faster recovery.</li> <li>• Conducting mock drills &amp; capacity building for employees and contractors</li> <li>• Obtaining appropriate insurance coverage to mitigate the financial impact of flood-related damages</li> </ul>
<b>Cyclone</b>	<ul style="list-style-type: none"> <li>• Developing a comprehensive emergency response plan that outlines procedures for severe weather events, including tropical cyclones and specifically focuses on protocols for personnel safety, equipment shutdown, and post-cyclone recovery procedures.</li> <li>• Ensuring that the plant's structural components, such as mounting systems and support structures, are designed and engineered to withstand fierce wind speeds associated with tropical cyclones.</li> <li>• Ensuring proper earthing at sites as per IS-3043 and lightning arrestor as per IS 3070-3</li> <li>• Adhering to local building codes and industry standards for wind load requirements.</li> <li>• Installing solar panels using appropriate mounting techniques and secure fastenings. Ensuring that panels are securely anchored to withstand high wind speeds and potential uplift forces during tropical cyclones.</li> <li>• Ensuring that wind turbines are designed and engineered to withstand the fierce winds associated with tropical cyclones.</li> <li>• Implementing turbine shutdown and locking systems that automatically activate when wind speeds reach a certain threshold, ensuring the safety of the turbines.</li> <li>• Conducting mock drills &amp; capacity building for employees and contractors</li> <li>• Reinforcing electrical infrastructure, such as wiring, inverters, and transformers, to withstand fierce winds and potential power surges. Securely fastening and protecting electrical components to minimize the risk of damage.</li> <li>• Using robust materials and construction techniques, including reinforced concrete or steel, to enhance the structural integrity of wind turbine towers; thus, strengthening tower structures to withstand high wind forces.</li> <li>• Implementing blade pitch control mechanisms to optimize the aerodynamic performance of the rotor blades during high winds; thus, allowing the blades to adjust their angle of attack, reducing stress and potential damage during cyclonic conditions.</li> <li>• Implementing advanced monitoring systems to track weather conditions and receive real-time updates on approaching tropical cyclones. Installing remote shutdown systems to safely shut down the plant before the cyclone arrives, minimizing the risk of damage.</li> <li>• Ensuring proper grounding of equipment to divert lightning and installing lightning protection systems, such as lightning rods and surge protectors, to safeguard the plant from lightning strikes that can occur during tropical cyclones.</li> <li>• Installing backup power systems, such as generators or energy storage, to provide electricity during and after a tropical cyclone when solar power generation may be disrupted.</li> </ul>

Risk description	Risk mitigation strategy
	<ul style="list-style-type: none"> <li>• Obtaining appropriate insurance coverage to mitigate the financial impact of cyclone-related damages.</li> </ul>
<b>Wildfire</b>	<ul style="list-style-type: none"> <li>• Developing a comprehensive emergency response plan that includes procedures for wildfire incidents, specifically outlining roles and responsibilities, evacuation routes, communication protocols, and coordination with local fire departments and authorities.</li> <li>• Establishing partnerships and maintaining regular communication with local fire departments and emergency services. Engaging in collaborative planning, share information on infrastructure locations, and coordinate response efforts.</li> <li>• Conducting regular training sessions and drills to ensure that employees and personnel are familiar with emergency procedures and understand their roles during a wildfire event; thus, targeting to improve response times and overall preparedness.</li> <li>• Ensuring regular trimming, mowing, or removing dry and flammable vegetation around the plant.</li> <li>• Ensuring all systems and equipment conform to National Fire Protection Authority (NFPA) fire safety standards and local fire authority requirements.</li> <li>• Creating a defensible space around the plant by clearing flammable materials and maintaining a buffer zone to prevent spread of wildfire towards the plants.</li> <li>• Constructing firebreaks and maintaining clear access roads within and around the plant to slow down or prevent the spread of wildfires, while facilitating firefighting activities and emergency response.</li> <li>• Installing fire suppression systems, such as fire sprinklers or water mist systems, in critical areas of the plant to help suppress small fires and control their spread until additional firefighting resources arrive.</li> <li>• Using fire-resistant materials and design features in the construction of the plant infrastructure, including buildings, equipment enclosures, control rooms, and electrical installations to help reduce the vulnerability of critical components to fire damage.</li> <li>• Deploying advanced fire detection and monitoring systems, including infrared cameras, smoke detectors, or aerial surveillance, to quickly identify and respond to wildfire threats; thus, allowing for a more effective and timely response</li> </ul>

**Mitigation Strategy for chronic physical risks**

Risk description	Risk mitigation strategy
<b>Temperature variability</b>	<ul style="list-style-type: none"> <li>• Implementing regular maintenance schedules to inspect and clean solar panels and wind turbine blades. Dust and debris accumulation can reduce efficiency and exacerbate the impact of high temperatures. Cleaning panels and wind turbine blades helps optimize their performance.</li> <li>• Implementing routine inspection protocols for checking electrical connections, monitoring lubrication systems, and inspecting structural components to identify and prevent potential issues caused by temperature extremes.</li> <li>• Exploring the possibility to optimize the design of wind turbines to withstand high temperatures and minimize heat accumulation.</li> </ul>



Risk description	Risk mitigation strategy
	<ul style="list-style-type: none"> <li>• Incorporating cooling systems such as fans or liquid cooling to dissipate excess heat and maintain optimal operating temperatures for wind turbines.</li> <li>• Moving components like inverter and combiner into the shaded area behind the array</li> <li>• Conducting mock drills &amp; capacity building for employees and contractors</li> <li>• Adopting effective cooling systems to maintain optimal operating temperatures for solar panels. Explore the feasibility of introducing cooling methods such as passive cooling, active cooling, cooling with phase change materials (PCMs), and cooling with PCM with other additives such as nanoparticles or porous metal to prevent panel degradation and ensure maximum energy production during high-temperature periods.</li> <li>• Applying reflective coatings on solar panel surfaces to minimize heat absorption by reflecting a portion of the incident sunlight to help lower the temperature of the panels and prevent overheating.</li> <li>• Optimizing the orientation and tilt of solar panels to minimize the impact of high ambient temperatures by providing better airflow around the panels and enhancing heat dissipation.</li> <li>• Increasing the spacing between solar panels to allow better air circulation and reduce the heat build-up between panels by preventing hotspots and maintaining panel efficiency.</li> <li>• Exploring the possibilities to utilize advanced materials and coatings that are designed to withstand high temperatures and reduce heat absorption to help mitigate the impact of temperature extremes on solar panels and increase their longevity.</li> <li>• Lightning strikes can cause damage to wind turbines and result in downtime. Considering lightning strikes can be more frequent during high temperatures, AGEL will proactively explore installing robust lightning protection systems to safeguard wind turbines against lightning strikes.</li> <li>• Utilizing advanced gearbox designs and high-temperature lubrication systems to enhance the durability and efficiency of wind turbines operating under high-temperature conditions to reduce wear and tear on critical components.</li> <li>• Exploring the possibility to introduce a robust weather monitoring system to track temperature variations and heatwaves in advance. This will help AGEL anticipate and take necessary precautions to minimize the impact on power generation.</li> <li>• Integrating energy storage systems with solar power plants to store excess energy during peak generation periods. This stored energy can be utilized during high-temperature events when solar panel efficiency may be affected.</li> <li>• Integrating energy storage systems with solar power plants to store excess energy during peak generation periods. This stored energy can be utilized during high-temperature events when solar panel efficiency may be affected.</li> <li>• Regularly reviewing emergency response plan to address temperature extremes while ensuring appropriate cooling measures are implemented for critical equipment and safety of personnel.</li> <li>• Exploring the possibility to introduce a real-time monitoring and management system which can help AGEL monitor temperature of wind turbine, solar panels, and other equipment, detect anomalies and inefficiencies promptly, and support in proactive maintenance to ensure efficient operation.</li> </ul>

**Mitigation Strategy for transition risks**

Risk description	Risk mitigation strategy
<p><b>Disposal of solar panel waste</b></p>	<ul style="list-style-type: none"> <li>• Regularly reviewing the evolving regulations and guidelines regarding the disposal and recycling of solar panels and ensuring strict compliance with these regulations to avoid penalties and legal consequences.</li> <li>• Developing a comprehensive plan for the end-of-life management of solar panels by considering the recycling, reuse, or proper disposal of panels at the end of their operational life.</li> <li>• Maintaining documentation and records for solar waste generated</li> <li>• Ensuring adequate storage facilities are available basis the solar waste that would be generated considering retirement of installed capacity.</li> <li>• Identifying authorized recycling facilities that can manage solar panel waste and ensuring that these companies have the necessary permits and comply with environmental regulations.</li> <li>• Maintaining a detailed documentation and records of the disposal process, including the transfer of waste to authorized recycling or disposal facilities to demonstrate compliance and evidence of responsible waste management practices.</li> <li>• Training employees and personnel on proper disposal procedures for solar panel waste. Creating awareness about the importance of responsible waste management and the potential penalties associated with improper disposal.</li> <li>• Conducting regular internal audits to ensure compliance with waste management practices.</li> <li>• Monitoring the activities of recycling or waste management partners to verify that they manage the waste according to regulations.</li> <li>• Engaging in industry initiatives and collaborating with other stakeholders to establish best practices and promote responsible disposal of solar panel waste. Participating in industry associations or forums focused on sustainability and waste management.</li> <li>• Regularly reviewing and improving waste management practices, keeping up with advancements in recycling technologies and techniques</li> </ul>

## Glossary and abbreviations

Abbreviation	Description
<b>ADB</b>	Asian Development Bank
<b>AGEL</b>	Adani Green Energy Ltd
<b>AR6</b>	Sixth Assessment Report
<b>B2B</b>	Business-To-Business
<b>BAU</b>	Business As Usual
<b>BRMC</b>	Business Risk Management Committee
<b>CDP</b>	Carbon Disclosure Project
<b>CEO</b>	Chief Executive Officer
<b>CII</b>	Confederation Of Indian Industry
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>COSO</b>	Committee Of Sponsoring Organizations
<b>CRC</b>	Corporate Responsibility Committee
<b>CRO</b>	Chief Risk Officer
<b>CSR</b>	Corporate Social Responsibility
<b>DISCOMS</b>	Distribution Companies
<b>ENDORSE</b>	Energy Diagnostics And Energy Support
<b>ENOC</b>	Energy Network Operations Centre
<b>ERM</b>	Enterprise Risk Management
<b>ESDD</b>	Environmental And Social Due Diligence
<b>ESG</b>	Environmental, Social, And Governance
<b>ESIA</b>	Environmental And Social Impact Assessment
<b>ESMS</b>	Environmental And Social Management System
<b>EV</b>	Electric Vehicle
<b>FRC</b>	Functional Risk Committees
<b>GHG</b>	Greenhouse Gas
<b>GRI</b>	Global Reporting Initiative
<b>GTC</b>	General Terms And Conditions
<b>GW</b>	Gigawatt
<b>HSE</b>	Health, Safety And Environment
<b>IBBI</b>	India Business Biodiversity Initiative
<b>ICP</b>	Internal Carbon Pricing
<b>IEA NZE Scenario</b>	Net Zero Emissions Scenario By International Energy Agency
<b>IFC</b>	International Finance Corporation
<b>IPCC</b>	Intergovernmental Panel On Climate Change
<b>IS 3070-3</b>	Indian Standard Is 3070-3: Lightning Arresters For Alternating Current Systems - Part 3 : Metal Oxide Lightning Arresters Without Gaps
<b>IS-3043</b>	Indian Standard Is-3043 Code Of Practice For Earthing
<b>KPIs</b>	Key Performance Indicators
<b>KRAs</b>	Key Responsibility Areas
<b>KRIs</b>	Key Risk Indicators
<b>MAAL</b>	Modelled Average Annual Loss
<b>MD</b>	Managing Director
<b>MTBF</b>	Mean-Time-Between- Failure
<b>MTTR</b>	Meantime To-Repair
<b>MW</b>	Megawatt

<b>Abbreviation</b>	<b>Description</b>
<b>NDC</b>	Nationally Determined Contribution
<b>NFPA</b>	National Fire Protection Authority
<b>NHPC</b>	National Hydroelectric Power Corporation
<b>NNL</b>	No Net Loss
<b>NTPC</b>	National Thermal Power Corporation
<b>O&amp;M</b>	Operations And Maintenance
<b>PCMs</b>	Phase Change Materials
<b>PPAs</b>	Power Purchase Agreements
<b>PS</b>	Performance Standards
<b>R&amp;D</b>	Research And Development
<b>RMC</b>	Risk Management Committee
<b>SCADA</b>	Supervisory Control And Data Acquisition
<b>SCoC</b>	Agel's Supplier Code Of Conduct
<b>SDG</b>	The Sustainable Development Goals
<b>SECI</b>	Solar Energy Corporation Of India Limited
<b>SOPs</b>	Standard Operating Procedures
<b>SSPs</b>	Shared Socioeconomic Pathways
<b>SUP</b>	Single-Use Plastic
<b>SuPF</b>	Single-Use Plastic-Free
<b>TCFD</b>	Task Force On Climate-Related Financial Disclosures
<b>tCO<sub>2</sub></b>	The Metric Tons Of Carbon Dioxide
<b>UNGC</b>	United Nations Global Compact
<b>WBCSD</b>	World Business Council For Sustainable Development
<b>ZWL</b>	Zero Waste To Landfill