

**FINAL REPORT**

# **Environmental & Social Impact Assessment (ESIA) of Proposed Hybrid project of solar 421.9 MW and wind 105 MW in Jaisalmer and Barmer Districts of Rajasthan**

FEBRUARY 2022



***Prepared for:***

**SBE RENEWABLES TEN PROJECTS PRIVATE LIMITED**

***Prepared by:***

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## EXECUTIVE SUMMARY

<p><b>Background</b></p>	<p>SBE Renewables Ten Project Private Limited (proponent) proposes to develop 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. SBE Renewables Ten Projects Pvt Ltd, a SoftBank Group ('Group') company, is a wholly owned step-down subsidiary of SB Energy Holdings Limited ("SBEHL"). SB Energy is a subsidiary of Adani Green Energy Ltd.</p> <p>The LOA (Letter of Authority) was awarded for the project on 25 Jan 2019 with a tariff of INR 2.67/kWh. Power Purchase Agreements was executed with SECI for the off take of the entire power produced from the Project for a period of 25 years on 31<sup>st</sup> of December 2019. SECI had issued two separate LOAs of 150 MW and 300 MW capacity and accordingly, two separate PPAs have been executed by the proponent.</p> <p>Considering this is an ISTS project, the Project Company shall be responsible for the land acquisition as well as development of the project following applicable rules and regulations. The grid developed by PGCIL (Power Grid Corporation of India Limited) located at Fatehgarh, Jaisalmer district, Rajasthan has been identified as the connecting GSS.</p> <p>Arcadis India Private Limited (hereafter referred as Arcadis) was appointed by SBE Renewables Ten Project Pvt Ltd to undertake an Environmental and Social Impact Assessment (ESIA) study of the mentioned hybrid power project in accordance with IFC's Performance Standards, Equator principles, World Bank Group's EHS Guidelines and applicable sector guidelines and national environmental laws and regulations.</p> <p>The main purpose of the ESIA study is to identify, evaluate and manage environmental and social impacts that may arise due to construction and operation of the project. The document has been prepared following IFC's Performance Standards, World Bank Group's EHS Guidelines and applicable sector guidelines, as well as applicable local and national regulations. The main objectives of the ESIA study may be highlighted as follows:</p> <ul style="list-style-type: none"> <li>• To identify and establish the baseline environmental and socioeconomic conditions, to analyse the environmental and social risk and impacts of the project and its associated components (facilities like transmission line, access road etc.)</li> <li>• Review of the land sourcing process to assess any legacy or current/existing issues (like informal settlers, livelihood dependence, other usage etc.) on the purchased/ leased land through suitable survey using acceptable socioeconomic tools. This will help in assessing the impact of the project on the community/ villagers.</li> <li>• Socio-economic survey involving consultation with local community, stakeholders, Land sellers, to identify the needs and problems of community with respect to the project activities.</li> <li>• To suggest appropriate safeguards for the associated environmental and social risk, which may not lead to project investment and activities at risk.</li> <li>• Shadow flickering and noise assessment and study of impact of flickering and noise on the nearby communities.</li> </ul> <p>The site visit for the ESIA study has been undertaken to assess any potential impacts (both negative and positive) that may arise from the construction, operation and decommissioning of the hybrid wind-solar plant. The main purpose of the ESIA study is to identify, evaluate and manage environmental and social impacts that may arise due to implementation and operation of the project. The Environmental and Social Impact Assessment (ESIA) study for the project has been undertaken in accordance with the scope of work assigned to Arcadis.</p>
<p><b>Project Overview</b></p>	<p>The proposed Hybrid project of solar 421.9 MW and wind 105 MW will be spread over 1090.223 ha. of government land parcel of which approximately 833.65 Ha. of land will be</p>

	<p>required for the Solar plant and 256.571 Ha. of land will be required for the Wind project. Land has been allotted to SBE on sub lease basis. The project is in construction stage. As reported by Proponent, for Solar Project in village Rivdi, 2060 Acres govt. land allotted, mutated and possession already taken for @ 100% land, while for Wind Project, 634 Acres govt. land allotted, where possession already taken for 100% locations. Reportedly for Transmission line and substation (PSS), recently excavation has been started on almost all govt. land and If there is some private land, an agreement has been done. Lease deeds for the entire land has been executed through revenue department with the project proponent.</p> <p>The identified land parcels are unused, fallow, and barren site. Topography is undulating to flat terrain at most of the locations with presence of few hillocks inside the boundary. Most of the locations are accessible through internal village road or kutchha road. NH 15 is passing through the site. Few water bodies are located near WTG location SBE-65, though they are seasonal/ rain-fed.</p> <p>PPA (Power Purchase Agreement) has been signed between the proponent and Solar Energy Corporation of India Limited on 31<sup>st</sup> day of December 2019.</p>
<p><b>Applicable IFC's Performance Standards</b></p>	<p>The following IFC's performance standards (PS) are applicable for this project:</p> <ul style="list-style-type: none"> <li>• PS 1: Assessment and Management of Environmental and Social Risks and Impacts,</li> <li>• PS 2: Labour and Working Conditions,</li> <li>• PS 3: Resource Efficiency &amp; Pollution Prevention,</li> <li>• PS 4: Community Health, Safety and Security.</li> <li>• PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources,</li> </ul> <p>The following IFC's performance standards are not applicable for this project:</p> <ul style="list-style-type: none"> <li>• PS 5: Land Acquisition and Involuntary Resettlement,</li> <li>• PS 7: Indigenous People</li> <li>• PS 8: Cultural Heritage</li> </ul>
<p><b>PS1: Social and Environmental Assessment and Management Systems</b></p>	<p>The project will have environmental and social impacts due to generation of onsite air emissions, noise, domestic wastes from site office and rest rooms, and generation of hazardous wastes from the construction site. SBE has developed Environmental &amp; Social Management System (ESMS) which needs to be followed and implemented to manage the risks associated with its operations. This ESIA report includes evaluation of project specific environment and social risks arising from the project activities along with recommended mitigation measures. SBE should also appoint qualified E&amp;S personnel with appropriate responsibility to implement/ oversee/ monitor the ESMS.</p> <p><b>Hence, PS1 is applicable.</b></p>
<p><b>PS2: Labour and Working Conditions</b></p>	<p>Labourers would be involved during construction and operation phase. As reported about 2000 workers/labours are estimated to be deployed during peak construction phase.</p> <p>The contractor's workforce will comprise of skilled, semi-skilled and unskilled labours, which may be sourced from the nearby village settlements depending on their skills and capabilities. There is a huge potential for employment of migrant labours on site.</p> <p>Labour camps will be constructed within the periphery of Site for solar project and for wind project arrangement will be made in nearby Villages /Town.</p> <p><b>Hence, PS 2 is applicable.</b></p>
<p><b>PS3: Resource Efficiency &amp; Pollution Prevention</b></p>	<p>The project involves use of resources like land and water. Improper handling of broken and damage solar panel may result in soil contamination. Improper handling of spent oil may lead to contamination of soil and ground water.</p> <p>Though topsoil is very limited in the area, wherever fertile land/ agriculture suitable land exists, Topsoil management is required during site levelling. Construction activities may lead to air and noise emission which needs to be managed. Broken / damaged solar panels may</p>

	<p>result in contamination of soil and ground water. The project would involve clearing of ground vegetation along with construction and demolition waste.</p> <p>Water will be required only for both construction as well as operation phases along with domestic purpose. Diesel/ transformer oil/ spent oil may contaminate soil and water.</p> <p><b>Hence, PS3 is applicable.</b></p>
<p><b>PS4: Community Health, Safety and Security</b></p>	<p>During construction phase the project envisages influx of labourers from nearby villages and these migrant labourers are expected to interact with community hence there is a possibility of conflict between migrant labourers and local community. Company and contractors will ensure proper stakeholder consultations, grievance redressal mechanism, communication to workers and other stakeholders to avoid any conflict between migrant labour and local community.</p> <p>Shadow flicker and noise emission during wind turbine operation may impact community health and safety but majority of the receptors are found to be rest house structures with temporary usage (Pump house, resting shade, Agricultural storage, during agricultural work) hence the impact is expected to be moderate.</p> <p>In India, there are no specific guidelines for wind power project on noise levels. As per IFC's General EHS Guidelines: Environmental, Noise Management, noise impacts should not result in a maximum increase in background levels of 3 dB(A) at the nearest receptor location off-site. The increment in ambient noise level due to WTG operations during daytime is within permissible limits prescribed for residential area (55 dB(A)). However during night-time the increment in ambient noise level due to WTG operations is anticipated to increase up to a range of 1.5 to 4.0 dB(A), and exceeding the permissible limit (45 dB(A)) during the operational phase of the project.</p> <p>Heavy vehicles would use the existing village roads. Several staff will remain involved during the operation period. The generated electrical energy will be transmitted through high voltage power line, thereby exposing the staff and community to electrical injury cannot be ignored.</p> <p>Construction of boundary wall may result in restriction of access/ increased distances from common property. Interaction of community with project staff especially security staff would occur.</p> <p><b>Thus, PS 4 is applicable.</b></p>
<p><b>PS5: Land Acquisition and Involuntary Resettlement</b></p>	<p>A total of 1090.223 Ha. of government land will be leased for the proposed hybrid power project. Out of that, 833.65 Ha. of government land will be leased for solar project from Rivdi village of Fatehgarh taluka in Jaisalmer district and 256.571 Ha. for wind project in seven (7) villages viz. Bherupura, Devka, Junejo Ki Dhani, Manihari, Harwa, Rajdel and Mati ka Gol of Shiv taluka in Barmer district. The government revenue land has been allotted to SBE on sublease basis. Lease deeds for the entire land has been executed through revenue department with the project proponent.</p> <p>The proposed project is to be developed on the government land by executing long term lease agreement and there by the project developer is not directly involved in land lease from any private parties. Appropriate compensation will be paid by the concerned Government department for the structures/ assets developed by the farmers on the government land. Since the project developer does not involve in any land acquisition or involuntary displacement is engaged due to the project development activities, PS 5 is therefore not applicable for the project.</p>
<p><b>PS 6: Biodiversity Conservation and Sustainable Management of Living</b></p>	<p>There is no eco-sensitive areas located in 10 km radius from the project site. However, Desert National Park is located at approximately 30 km from the land parcel in solar site- Survey No 295 and 45 kms from WTG- SBE 37. The nearby area within 10 km radius of the proposed project site is mainly dominated by open scrubby vegetation, stony wasteland, and few grazing lands.</p> <p>Project site is almost at equal distance from Jaisalmer and Barmer, conferring to Avibase 371 species are recorded from Jaisalmer while 312 species are recorded from Barmer, and</p>

<p><b>Natural Resources</b></p>	<p>257 species are recorded from Desert National Park. While in E-bird 325 species of birds are recorded from Jaisalmer and 227 species from Barmer.</p> <p>In the landscape 5 species are critically endangered including great Indian Bustard, seven species are Near threatened and Vulnerable while 3 species are endangered according to IUCN red list.</p> <p>Apart from Great Indian Bustard four other critically endangered species are Sociable lapwing, Red-headed vulture, White-rumped Vulture and Indian Vulture.</p> <p>Looking at the fact that DNP is not very far, good raptor species and vulture species are present in the landscape and so there are chances of this bird getting collide with the wind turbine or transmission line.</p> <p>The project area comprises of non-forest wastelands and fallow lands. Among the project area solar pocket is around 72 km from the GIB priority area and wind pocket is 90 km from the GIB priority area. And project area is falling under GIB potential, according to WII guidelines powerlines can be laid in the potential area with proper mitigation measures.</p> <p>Though the priority area is at significant distance from the project area there is possibility of GIB visiting the project site during local migration.</p> <p><b>Therefore PS 6 is applicable for the project.</b></p>
<p><b>PS 7: Indigenous Peoples</b></p>	<p>No impact on tribal community has been envisaged as the project development will be on government land. No Bhil community/ People have their land in the proposed solar site or wind site. So, PS 7 is not applicable.</p> <p><b>Hence, PS 7 is not applicable</b></p>
<p><b>PS8: Cultural Heritage</b></p>	<p>There is no designated archaeological or cultural heritage site within 10 Km radius of the study area village and there no cultural or religious important place is affected due to the project.</p> <p><b>Hence, PS 8 is not applicable.</b></p>
<p><b>Key impacts during construction phase</b></p>	<p><b>Impact on water body:</b> Few Surface water (seasonal/ rain-fed) exists near some WTG locations. Therefore, surface water may be impacted through usage and thus, moderate impact on existing drainage is envisaged and this impact is limited to construction phase only.</p> <p><b>Impact on air quality:</b> Generation of fugitive dust due to movement of project vehicles, transportation of fine material (if not covered) and emission from diesel generators and vehicles. Impact will be limited to the construction phase only.</p> <p><b>Water resources:</b> As reported to Arcadis, water will be sourced from safe authorized sources through vendor and supplied by tanker during construction phase and will be under the scope of the EPC Contractor. Drinking water requirement during the construction phase will be met via local tankers/ approved vendors. As per the categorization by CGWB the Blocks where the project sites are located falls under over exploited category. Hence, impact on the ground water is anticipated to be High.</p> <p>As per Project DPR, water availability for site construction may be delivered by from authorized bore wells outside the plant area but the water quality may need to be assessed by the developer for construction use. In case if Ground water is used then prior approval from the appropriate Government Water supply authority shall be taken. Water can also be made available by tankers and open reservoirs, though the authorized water suppliers. Additionally, plant may also develop its own internal water harvesting system as feasible after the topography study to elevate the ground water level in the area. The Project may have in-house developed semi-automatic module cleaning system which uses compressed air and water for module cleaning. The Project Company is exploring dry (Waterless) cleaning technologies which will be included intermittently with semi-automatic cleaning system</p>

	<p>currently implemented. It is proposed to develop rainwater harvesting cum storage facilities within site to meet the water requirement of the project as well as for the benefit elevating ground water level.</p> <p>Water requirement as per MNRE is 5.5 KL per MW of solar for 10 wet cycles in a year which amounts to 55 KL per MW of solar per year or total 23,100 KL per year (or 77 KLD considering 300 days in a year) for the entire solar project.</p> <p><b>Conflict between migrant and local community:</b> During construction phase the project envisages influx of labourers from nearby villages and migrant labourers, these labours are expected to interact with community, there is a possibility of confrontation between migrant labourers and local community.</p> <p><b>Traffic Load:</b> The project site is connected to the National Highway (NH-15). The selected land for WTGs is adjacent to the NH-15. This will be used for movement of trailer trucks carrying the equipment and materials. This movement is expected to result in increase in ambient noise levels. However, this increase is short term during construction stage only.</p> <p><b>Impact on Ecology:</b></p> <p>There will be minimal clearing of vegetation during the construction phase. As per published secondary information (eBird &amp; IUCN) no critically endangered wild species observed in the area. However, animals like Nilgai, Chinkara, Indian Hare could be impacted during the construction phase due to the movement of vehicles carrying raw materials. Therefore, the impact on ecology is envisaged to be Moderate.</p>
<p><b>Key impacts during operation phase</b></p>	<p><b>Soil &amp; ground water contamination:</b> Improper handling of broken/ damaged solar panels spent oil may result in contamination of soil and ground water. Diesel/ transformer oil/ spent oil may contaminate soil and water.</p> <p><b>Water resources:</b> As reported to Arcadis, water will be sourced from safe authorized sources through vendor and supplied by tanker and will be under the scope of the EPC Contractor. Drinking water requirement will be met via local tankers/ approved vendors. As per the categorization by CGWB the Blocks where the project sites are located falls under over exploited category. Hence, impact on the ground water is anticipated to be High.</p> <p>As per Project DPR, the Project may have in-house developed semi-automatic module cleaning system which uses compressed air and water for module cleaning. The Project Company is exploring dry (Waterless) cleaning technologies which will be included intermittently with semi-automatic cleaning system currently implemented. It is proposed to develop rainwater harvesting cum storage facilities within site to meet the water requirement of the project as well as for the benefit elevating ground water level.</p> <p>Water requirement as per MNRE is 5.5 KL per MW of solar for 10 wet cycles in a year which amounts to 55 KL per MW of solar per year or total 23,100 KL per year (or 77 KLD considering 300 days in a year) for the entire solar project.</p> <p>Water will also be required for domestic purposes by the operations staff. Considering the distribution of impact within the site, long duration with intensity, significance of impact is assessed as <b>High</b>.</p> <p><b>Occupational health and safety of workers:</b> Accidents like electrocution, short circuits may lead to occupational health and safety issues, for which proper training to workers need to be given to combat the same as well as it needs to be further ensured that the workers wear appropriate PPE's according to their nature of work involved.</p> <p><b>Social Welfare:</b> Locals may get dissatisfied due to influx of migrant labour. To reduce dissatisfaction among local people regarding the project activity, maximum job opportunity should be provided to the locals on priority during construction phase. Besides, a community development plan along with a grievance redressal mechanism should be followed. It should be ensured that a complaint register is maintained onsite so that any complaints from the stakeholders, locals or labors can be registered, investigated, and timely resolved.</p>

	<p><b>Ecology &amp; Biodiversity:</b> WTG locations which were at proximity to water bodies (WTGs SBE-47, NEW5, SBE-49 and SBE-61) which were prone to collision of birds due to proximity of a seasonal water body (holding water in season) along with an Agricultural Plot holding water (locally called as Khadin) were dropped from consideration. It is generally reported that maximum avian deaths are caused due to collision with transmission lines &amp; WTG blades, hence the project proponent will be using bird diverters at 20ms at closer to the Transmission line or sensitive locations, painting the WTG blades and other necessary steps as per standard guidelines. Any dead animals/carcass shall be removed in time from the site so that it does not attract movement of raptors near to the WTGs. While planning project transmission lines, feasibility should be checked for avoiding water bodies crossings. This can be considered for water bodies that could be important when they turn into suitable habitats. Towers be regularly checked to avoid any nesting in any suitable gaps or platforms. Flash lamps on the WTGs should be installed to reduce the collision risks during nights. Vehicular movements during operation phase are to be set up with speed limits to avoid road kills. All due to the possible avifaunal collision risk the impact on ecology is envisaged to be <b>moderate</b>.</p> <p><b>Community Health and Safety:</b> Impact may be envisaged due to electromagnetic fields, noise, shadow flicker and accidental blade throw. But with appropriate mitigation measures, the same can be minimized.</p> <p><b>Noise:</b> Wind turbines produce noise through a number of different mechanisms, which can be roughly grouped into mechanical and aerodynamic sources. Wind turbines noise could impact on annoyance, sleep and health of the residents at close proximity to the wind turbines. Reconnaissance survey highlighted majority of the receptors to be rest house structures with temporary usage (seasonal usage, Pump house, cattle shade, resting shade as shelter during agricultural work).</p> <ul style="list-style-type: none"> <li>• The increment in ambient noise level due to WTG operations during daytime and night time is within permissible limits prescribed for residential area (55 db (A)). However, during night time the increment in ambient noise level due to WTG operations is anticipated to increase up to a range of 0.4 to 4.3 dB(A) and exceeding the permissible limit (45 db (A)) during the operational phase of the project.</li> <li>• Distances of the identified noise sensitive receptors from the nearest WTGs varies from 137 m to 300 m</li> <li>• Out of 7 Identified receptors of noise sensitive areas, AH (NR 34), BF (NR 58), AI (NR 35) are village settlements, AW (NR 49) is assumed to be a shed storage area having demarcated boundaries, AO (NR 41) and BB (NR 54) are independent houses, E (NR 5) appears to be a shed of agriculture-storage, where all seems to be permanent structures and for them mitigation measures suggested in this report is to be followed.</li> </ul> <p><b>Shadow flicker impact:</b> Shadow Flicker Modelling results show that out all the 11 identified receptors will receive shadow for more than 30 hours per year from total 24 WTGs with minimum being 31:53 hours / year to maximum being 121:43 hours / year with distances from WTGs ranging between 179 m to 2.2 km.</p> <p>All of these receptors seem to be permanent structures and mitigation measures suggested in the report shall be followed. Identification of structures depicted in <b>Table 37</b>. The modelling results is provided in <b>Appendix. G</b>.</p> <p><b>Blade Throw:</b> A failure of the rotor blade can result in the “throwing” of a rotor blade, or part thereof, which may affect public safety which are mainly because of mechanical failures. The overall risk of blade throw is extremely low with regular maintenance. Mandatory safety standards in turbine design, manufacturing, and installation as well as more frequent maintenance have made the occurrence of blade throw a rare phenomenon. Wind turbines can also be equipped with vibration sensors that can react to any imbalance in the rotor blades and automatically shut down the turbine if necessary, to avoid any chance of blade</p>
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	<p>throw. The impact due to potential blade throw is expected to be of local spread, long duration and low intensity with mitigation measures and the overall impact is assessed to be insignificant.</p>
<p><b>Key Mitigation Measures</b></p>	<p>Appropriate mitigation measures have been planned and recommended in the ESIA report. These measures will minimise the impacts on air, water, soil, noise quality, solid and liquid effluent waste, ecology and socio-economic conditions. The activities of the project during both construction and operation phase will help in improving the socioeconomic condition of the surrounding area.</p> <p><b>Construction Phase</b></p> <ul style="list-style-type: none"> <li>• Proper water sprinkling of road should be undertaken to reduce the fugitive emissions during transportation.</li> <li>• Wind turbines should be designed in accordance with the international acoustic design standards.</li> <li>• Grievance Redressal mechanism should be followed by SBE and its sub-contractors. It should be ensured that a complaint register is maintained onsite so that any complaints from the locals or labours can be registered, investigated and timely resolved.</li> <li>• Proper PPE's viz. gloves, glasses, helmet and shoes should be worn by workers/labours while handling solar panels as well as during other activity during construction phase.</li> <li>• It should be ensured that the accommodation provided to the migrant workers should meet national and international standards laid down by ILO, IFC. Basic amenities such as electricity, potable drinking water, waste disposal, health &amp; sanitation facility and kitchen to be provided.</li> <li>• Integral noise shielding to be used where practicable and fixed noise sources to be acoustically treated by using for example silencers, acoustic louvers and enclosures.</li> <li>• Strict prohibition shall be implemented on trapping, hunting or injuring wildlife within subcontractors and shall bring a penalty clause under contractual agreements.</li> <li>• Camp and kitchen waste shall be collected in a manner that it does not attract wild animals.</li> <li>• Temporary barriers/fencing shall be installed on excavated areas.</li> <li>• The speed limit of the heavy vehicles should be maintained.</li> <li>• All the vehicle should have valid PUC certificate.</li> <li>• Hazardous materials such as waste oil, used oil should be stored at designated locations in enclosed structures over impermeable surface.</li> <li>• Hazardous Waste authorization as per Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 should be obtained</li> <li>• NOC for ground water abstraction or surface water procurement should be obtained in the event developer/project proponent install bore well for ground water abstraction or procure borewell water or procure surface water to meet water requirement for the project activity as it is a highly water scarce area.</li> <li>• Complaint register should be maintained onsite to receive complaints from locals and workers</li> </ul> <p><b>Operational Phase:</b></p> <ul style="list-style-type: none"> <li>• Sourcing of water from approved vendors should be considered by EPC contractor. As</li> </ul>



per Project DPR, water for site construction may be delivered from authorized bore wells outside the plant area but the water quality may need to be assessed by the developer for construction use. In case if Ground water is used then prior approval from the appropriate Government Water supply authority shall be taken. Water can also be made available by tankers and open reservoirs, though the authorized water suppliers. Additionally, plant may also develop its own internal water harvesting system as feasible after the topography study to elevate the ground water level in the area.

As suggested in DPR, site team supervises and keeps all record washing schedule as well monitors soiling loss to optimize cleaning cycle periodicity. Most of the solar projects have in-house developed semi-automatic module cleaning system which uses compressed air and water for module cleaning. The Project Company is exploring dry (Waterless) cleaning technologies which will be included intermittently with semi-automatic cleaning system currently implemented. Arcadis recommends waterless robotic cleaning system as an appropriate mitigation measure to conserve water level in the surrounding area.

- Implement the recommended complaint resolution procedure (Grievance Redress Mechanism) to assure that any complaints regarding noise and shadow flickering or any other issue related to project activity is not left unnoticed. The complaints should be registered, investigated, and timely resolved.
- To minimize "Lake effect", visual frightening techniques should be considered to frighten any bird trying to land on panels and prevent birds from landing.
- Use of curtains, higher fencing and planting trees can be explored at locations which will get impacted due to shadow flicker, if required provisions should be made.
- Rainwater harvesting structures/ water conservation structures should be used to meet the operational water needs
- Hazardous waste viz. waste oil, used transformer oil, used grease, wastes or residues containing oil, empty barrels/ containers/ liners wastes or residues containing oil etc. will be collected and stored in paved and enclosed area with secondary containment and subsequently sold to authorized recyclers/ Transfer storage disposal facility (TSDF) in compliance with RSPCB norms.
- Vehicular movements during construction phase are to be set up with speed limits to avoid road kills.
- Bird diverter should be installed in transmission line which the client will be complying with respect to the sensitive areas.
- Painting the tip of the blades for better visibility
- Towers be regularly checked to avoid any nesting in any suitable gaps or platforms.
- Flash lamps on the WTGs should be installed to reduce the collision risks during nights.
- If any nests of ground dwelling birds/ reptiles are found the Forest Department is to be notified so that the eggs of reptiles/ birds don't get displaced.
- Implement the recommended complaint resolution procedure (Grievance Redress Mechanism) to assure that any complaints regarding noise and shadow flickering or any other issue related to project activity is not left unnoticed. The complaints should be registered, investigated, and timely resolved.
- Visibility enhancement objects such as marker balls, bird deterrents, or diverters can be installed along the transmission line to avoid bird collision.
- The tip of blades should be painted to increase visibility and avoid collision
- The powerline collisions and electrocution are considered as major threats to avian

	<p>species. Large birds such as cranes and bustards are more susceptible to collisions due to low visibility and height of these structures with respect to the altitude of the flight (Tere and Parasharya 2011). The birds of prey and soaring birds are more vulnerable to collision with power transmission lines (Harness et al. 2013). The waterbodies nearby can be the roosting spots of many migratory birds especially in winter. Presence of cranes landscape are known for their toughest migration by crossing Himalayas and spending winter in western Rajasthan (Jain et al. 2005). The basic minimum is to install and maintain bird diverters or reflectors on entire power transmission lines to be laid for the project as per the IFC guidelines. Its efficacy should also be tested. We are providing following preliminary observations. Firm mitigation measures can only be provided after robust, multi season, systematic study.</p> <ol style="list-style-type: none"> <li>1. Use of bird diverters or deflectors to make the powerlines more visible.</li> <li>2. Sufficient spacing between conductors and powerlines to accommodate the wide wingspan of large raptors like Vultures and eagles.</li> <li>3. Proper insulation of cables closes to poles that are used for perching by the birds.</li> <li>4. Avoid clustering of powerlines.</li> <li>5. Pre and post construction monitoring of bird mortality and displacement evaluation along the powerlines and timely intervention, if required. These mitigations are also a part of the mitigation table.</li> </ol> <p><b><u>Decommissioning Phase:</u></b></p> <ul style="list-style-type: none"> <li>• Decommissioning consists of the removal of facility components, the management of excess materials and waste and the restoration of Project Location lands and waters, as applicable to facilitate the anticipated future use of the land.</li> <li>• This Decommissioning Plan should be done to assist the project proponent in fulfilling regulatory requirements as mandated by government agencies for the decommissioning of the Project.</li> <li>• The project proponent will adhere to the decommissioning requirements provided in their decommissioning report and will ensure that the project location is restored to a condition appropriate for its future use.</li> <li>• Decommissioning of the project and any ancillary equipment can be conducted in such a manner as to ensure that there will be no significant negative environmental effects.</li> </ul>
<p><b>Conclusion and Recommendation</b></p>	<p>The Hybrid power project is not likely to have significant adverse environmental impacts that are sensitive, diverse or unprecedented. It is envisaged to have moderate impact due to issues related to community safety during the construction period, insignificant impact due to generation of dust and fugitive emissions and minor impact on resource utilization like land and socio-economic conditions of project area villages. There is no impact on cultural resources in the study area. The impacts anticipated during the operation phase is fugitive emissions from movement of project vehicles within the site (air environment), impact on soil due to storage and spillage of hazardous wastes used oil and transformer oil (land environment) as well as use of ground water (if any) resources during operation phase, which can be mitigated by adopting suggested mitigation measures. Considering the short duration, localized distribution and low intensity, noise and shadow flicker impact has been assessed as <b>Low</b> significance and can be controlled with the recommended mitigation measures.</p> <p>However, the avifaunal collision risk due to operation of wind turbines cannot be ruled out and hence the overall impact on birds and bats due to the project activity during the operational phase is "Moderate". All mitigations for avoiding the same are to be implemented.</p>
<p><b>This Executive Summary should be read in conjunction with the full report and reflects an assessment of the site based on information received by Arcadis at the time of reporting.</b></p>	

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