Project Climate Risk Assessment and Management Report

I. Basic Project Information

Project Title: IND: Assam Power Sector Investment Program –Tranche 2
Project Budget: $48 million
Location: Sivasagar, Dibrugarh, Jorhat, Tinsukia, Golaghat, Sonitpur, Nagaon, Lakhimpur & Dhemaji, Cachar, Hailakandi & Karimganj, Marigaon, Barpeta, Nalbari, Kamrup Metro, Darang, Bongaigaon, Kokrajhar, Kamrup Rural, State of Assam, India
Sector: Energy
Theme: Power Distribution
Brief Description: Tranche 2 of the investment program with amount of $48 million aims to fund an expansion and up-gradation of power distribution system in the state of Assam, India as well as strengthen institutional capacity of Assam Power Distribution Company Limited and Assam Power Generation Company Limited. It covers part of the state's power sector road map of enhancing the sub-transmission and distribution capacities to improve operational efficiency and electricity service to end users.

II. Summary of Climate Risk Screening and Assessment

A. Sensitivity of project component(s) to climate/weather conditions and sea level	
Project component **1. Expansion and up-gradation of the distribution system.** **Expansion:** (i) one new substation (33/11 kV), total capacity 10 MVA; (ii) construction of additional 4 km of new 33 kV line and 6 km of new 11 kV line for connecting the new substation; (iii) construction of 140 km of 33 kV line for system strengthening; (iv) construction of 11x33 kV terminal bays; (v) construction of 5x33 kV railway track crossing (0.85 km); (vi) construction of 1x33 kV river crossing (0.35 km); and (vii) construction of 7 km of new 11 kV line for segregation from ruralfeeder. **Up-gradation:** (i) refurbishment & modernization (R&M) of 956 km of 33 kV line; R&M of 6x33 kV terminal bays; R&M of 1,000 km of 11 kV line; (ii) R&M of 1,555 km of Low Tension (LT) line; and (iii) replacement of 204 oil-filled distribution transformer (DTR, 11/0.4 kV, 250 kVA) by dry type DTR in busy places as a safety measure; and replacement of 14 km of overhead high tension (HT) and LT line in Guwahati City by underground (UG) cabling. **2. Strengthening institutional capacity of APDCL and APGCL.**	*Sensitivity to climate/weather conditions and sea level* 1. Extreme temperature fluctuations can cause distribution lines to sag. Flooding can affect the integrity of transmission towers. *2.* Increase in temperature can reduce the efficiency of distribution lines by increasing resistance. Flooding can affect the location and integrity of the sub-station.
B. Climate Risk Screening	
Risk topic *1. Temperature increase* *2. Precipitation*	Description of the risk 1. Annual mean temperature by 2050 in the State of Assam is projected to increase by 2.38^{0}C under the A2 scenario. The magnitude of temperature rise increases along with increasing latitude i.e. the northern part of the state is projected to experience a higher temperature rise. Seasonally, January–April period is projected to experience higher temperature rise (>2.5^{0}C). The highest temperature rise is projected to occur in March (>2.7^{0}C) and the lowest in August (2.0^{0}C). 2. Under the same scenario, annual total precipitation is

	projected to increase by 126 mm or 5.2%. The increase is projected to occur overwhelmingly (97%) during the April–October season. Spatially, precipitation increase in terms of percentages is projected to be slightly higher for the project areas within Nagaon and Darrang districts (>6%).

Climate Risk Classification: Medium

C. Climate risk assessment

1. The main climate impact on the current project is the increased flood risks. The substation is located on the edge of the floodplains of the River Brahmaputra. Future projections indicate that the peak flows during both the monsoon and the pre-monsoon season are expected to increase;
2. Increased wind speed of tropical cyclones may cause more damages to the overhead transmission lines;
3. Increased lightning activities. Lightning is one of the most serious causes of over-voltage;
4. The impact of rising temperatures on electricity transmission and distribution includes thermal expansion of power lines resulting in line sag, increased resistance of transmission, as well as decreased amount of power that can be securely transported. However, the effects of rising temperatures are not expected to be significant since the average maximum temperature of the state of Assam during July is only projected to reach 32^0C.

III. Climate Risk Management Response within the Project

1. Project will help better cope with climate variability and change through specifically identifying and locating the substation and distribution towers in elevated landscape from the river.
2. In addition to mitigate the potential climate change impact, it is recommended to take into account flood risk, risk of heavy winds, landslide, forest fire, GLOF and lightening during the construction of the substation and distribution lines. Initial design during the construction includes elevation of the foundations for the substation and overhead distribution lines will be constructed to withstand strong winds.
3. Specifications of distribution lines are expected to withstand the projected increase in ambient temperature and have limited impacts to sagging and overall efficiency.