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Analysis of Primary HPP Construction Risks

This client alert analyses the primary Employer risks, arising out of the construction of major hydropower projects in emerging market countries, funded by equity contributions and senior-secured, limited-recourse, project level, debt financing (each, an “HPP”). Unless the context otherwise requires, capitalized terms used in this Client Release shall have the meanings defined in the FIDIC Silver Book (First Edition).

PRIMARY HPP CONSTRUCTION RISKS

We discuss below the primary risks that arise during the construction of HPPs:

COMMENCEMENT OF WORK DELAYS

Following the selection by Employer of one or more Contractors to perform the Works and the signing of the Contract(s), either of the following two factors can materially delay the Contractor’s ability to commence such Works, causing a re-negotiation of the Contract Price between Contractor and Employer due to schedule delays:

- a. Signing by Employer of the Construction Contracts with an agreed Contract Price in a form that does not satisfy bankability requirements of Project Lenders, which requires a re-negotiation of material terms of the Construction Contracts; and
- b. Employer encountering unexpected delays in achieving first disbursement of the loans made available by Project Lenders to Employer, which prevent Employer from remitting the Advance Payment and demonstrating its ability to fund payments under the Contracts;

Delays of the commencement of the Works can have significant schedule impacts on projects that can only test and commission the completed hydropower facility during a specific window of time each year (e.g., during the wet season). To mitigate Employer’s risk under paragraph (a) above, Employer should identify, and involve, Project Lenders at an early stage in the development process, soliciting their input on the form of Construction Contracts, during the procurement process and prior to



signing. To mitigate Employer's risk under paragraph (b) above, the Construction Contracts should (i) stipulate a fixed time period during which the Contracts will remain effective notwithstanding a delay of the commencement of the Works, and (ii) allow Employer to issue a limited notice to proceed ("LNTP") prior to the Commencement Date, requiring Contractor to perform certain early stage Work on a limited basis.

UNFORESEEN SUB-SURFACE CONDITIONS

Encountering sub-surface conditions while performing Works at the Site, which materially differ from the conditions evidenced by sub-surface investigations performed by Employer prior to signing of the Construction Contracts, represents one of the most frequently re-occurring sources of cost overruns and schedule delays during the construction of HPPs. During the construction procurement process, Employer must manage the tension between (i) allocating this risk to Contractor as envisioned by the FIDIC Silver Book, which most Contractors will either decline to take or accept but with a substantial premium on the Contract Price, and (ii) allocating this risk to Employer by paying Contractor on a Bill-of-Quantities basis contemplated by the FIDIC Red Book, which reduces Contractor's incentive to perform the Works in a cost-efficient manner. To manage this risk, we recommend that Employer:

- a. perform at its own expense a detailed geotechnical investigation of sub-surface conditions around the proposed locations for the impoundment structure, spillway, intake structure, power generation facility, diversion tunnels, headrace tunnels and/or tailrace tunnels at the Site (as applicable) prior to construction tendering; and
- b. prepare a Geotechnical Baseline Report for inclusion in the contract, which (i) identifies the baseline geological conditions at the Site upon which Contractor will rely when finalizing the Contract Price for bidding purposes, using the data collected during such investigation, and (ii) contains pre-agreed time extensions and unit price differentials for constructing in geological conditions that vary from the baseline conditions because of rock hardness and other differing subsurface conditions that increase costs such as clay seams.

HSES RISK MANAGEMENT

HPP construction involves significant health, safety, environmental and social risks and impacts, which if managed incorrectly can lead to major public relation issues for project sponsors as well as Project Lenders, and in a worst-case scenario an acceleration of loans by Project Lenders, loss of sponsor support made available by project sponsors and major schedule delays (the "HSES Risks"). To facilitate the management of this risk by Employer, the Construction Contracts should obligate Contractor to:

- a. comply with, a Health, Safety, Environment and Social Management Programme;
- b. comply with project-specific obligations developed by Employer, based on the Environmental & Social Impact Assessment for the project;
- c. appoint and maintain at the Site a Health, Safety & Environmental Manager; and
- d. report any compliance violations in its monthly progress report submitted to Employer; in each case during the performance of the Works.

CORRUPTION RISK MANAGEMENT

Like HSES Risks, the engagement by Contractor or any of its subcontractors in acts of corruption during the performance of the Works such as the remittance of payments to government officials that facilitate (i) the issuance of permits for time-critical matters such as tree cutting, extraction of quarry materials and disposal of excavation materials, (ii) clearance of imported Plant, Materials or Contractor's Equipment through customs of the host country, (iii) processing of visa applications for Contractor's Personnel entering the host country as an expatriate, and (iv)



transporting generation units and other heavy-equipment on public roads to the Site, in each case exposes Employer and Project Lenders to major public relations issues and unwanted scrutiny by NGOs. To facilitate Employer's management of this risk, the Construction Contracts should obligate Contractor to:

- a. comply, and ensure that its subcontractors comply, with detailed Anti-Corruption Guidelines, commonly accepted by multilateral lenders, financial institutions and export credit agencies that make available debt financing for the construction of HPPs; and
- b. prior to commencing the Works, deliver to Employer a Declaration of Understanding in a pre-agreed form, signed by Contractor's senior manager based on Site, who declares his / her understanding of (i) Employer's zero tolerance policy for corruption, (ii) Employer's right to immediately terminate the Contract in the event of any violation of such policy by Contractor or its subcontractors, (iii) Contractor's obligation to comply with the Anti-Corruption Guidelines, and (iv) their obligation to immediately notify Employer upon becoming aware of any violations of such guidelines.

HYDROLOGY RISK

Certain types of hydrological conditions at the Site can adversely impact the schedule for constructing a hydropower facility such as:

- a. insufficient river flow conditions at Site at the time of mechanical completion of the facility, which prevent testing and commissioning, caused by (i) drought, (i) impoundment / diversion of river flows upstream of the project, or (iii) other schedule delays unrelated to hydrology, which postpone the testing and commissioning period until the dry season; and
- b. excess river flow conditions at Site, which either flood significant portions of the Site or overwhelm the spillway's capacity and breach the impoundment structure, preventing the performance of the Works and, in the latter case, severely damaging the Works.

While Employer may rely on the Unforeseeable Difficulties clause of the FIDIC Silver Book, this clause allocates hydrology risk to the Contractor but only to the extent that the relevant hydrology event does NOT qualify as an unforeseeable event of Force Majeure. If such hydrology event qualifies as a Force Majeure, Employer takes delay risk caused by such event and Contractor takes the risk of cost increases.

To reduce the likelihood of litigation arising out of a hydrology-related Force Majeure claim by Contractor, we recommend the inclusion of "Unforeseeable Hydrology Event" as an additional limb in the definition of Force Majeure, where:

"Unforeseeable Hydrology Event" means, for any calendar month, an average monthly river flow at the Site that either (i) falls below the P90 river flow, or (ii) exceeds the P5 river flow, in each case for such month.

INSOLVENCY RISK

The insolvency of Contractor during the performance of the Works will most likely result in substantial cost overruns and schedule delays as Employer will typically terminate the Contract under these circumstances and negotiate, finalize and execute a new Contract with a replacement Contractor. To facilitate Employer's management of this risk, we recommend that:

- a. Employer undertake an extensive financial due diligence of a candidate Contractor and verify before entering into the Contract that such Contractor has sufficiently-strong balance sheet to support the performance of the Works;



- b. to the extent that Contractor entity signing the Contract lacks a strong balance sheet but has a Parent Company with a strong balance sheet, the Contract should obligate Contractor to deliver a Parent Company Guarantee prior to the commencement of the Works; and
- c. the Contract obligate Contractor to (i) deliver an on-demand bank guarantee, duly-issued by a qualified bank, prior to the commencement of the Works with a face amount of at least 20% of the Contract Price until take-over of the Works by Employer, which steps down to a lower level during the Defects Notification Period, and (ii) maintain such guarantee in full force and effect through the expiration of the Defects Notification Period.

TUNNEL COLLAPSE

The collapse of diversion, headrace and/or tailrace tunnels during testing and commissioning or the Defects Notification Period results in substantial cost overruns, schedule delays, lost revenue and, because of the substantial periods required for repairs, the risk of loan default by Employer. These collapse incidents in many cases occur following the first de-watering of an unlined tunnel that passed through rock with seams of swelling clay, which Employer did not identify during the Site investigation. The clay seems expand upon de-watering, causing the rock to fracture and collapse. To the extent that unforeseen subsurface conditions led to the collapse incident, Contractor will claim no responsibility for the error and omission of the tunnel design since its design would have worked under the baseline geotechnical conditions. To mitigate the risk of tunnel collapse, we recommend that:

- a. for hydropower facilities with unlined tunnels, Employer's Requirements require the de-watering of such tunnels as part of the Tests on Completion performed by Contractor;
- b. the Contract require Contractor to (i) promptly notify Employer of encountering sub-surface conditions that differ from the baseline geotechnical conditions, during the process of tunnel excavation, and (ii) if necessary, adjust the tunnel design to accommodate the actual geological conditions by way of a Variation; and
- c. Employer procure (i) delay in start-up insurance, which covers collapse incidents that occur prior to take-over of the Works by Employer, and (ii) business interruption Insurance, which covers collapse incidents that occur post take-over of the Works.

Under these circumstances, Employer must rely on the proceeds from unutilized sponsor support and insurance policies to fund both the repair of the tunnels and debt service during the repair period. Project sponsors must prepare themselves for a liquidity shortfall during this period, arising out of the relatively slow insurance recovery process, which often involves litigation.

INTERCONNECTION FACILITY DELAYS

On HPPs where a third party (usually the grid system operator) undertakes responsibility for the construction of the transmission facilities, which connect the hydropower facility with the existing high-voltage grid system of the host country, a delay in the completion of such facilities, which overlaps with the schedule for conducting the Tests on Completion, will result in schedule days, additional costs to the Employer and a loss of revenue that could jeopardize Employer's ability to remit debt service. To mitigate the risk of interconnection facility delays, we recommend that:

- a. to the maximum extent possible, Employer pursue the responsibility for constructing the interconnection facility with the government authorities of the host country as a part of its HPP development strategy; and
- b. to the extent that a third-party undertakes this responsibility, Employer may wish to pursue one or more of the following two strategies for mitigating this risk:



- i. Entering into a direct agreement with such third party, which sets forth the schedule for completion of such facilities and a provision for delay liquidated damages that will allow Employer (A) at a minimum to pay debt service during facility completion days, and (B) ideally, recover its lost revenue; or
- ii. On HPPs with a power purchase agreement for the sale of capacity (not energy), include the concept of “deemed Commercial Operation Date” in the agreement, which allocates completion risk to the offtaker by requiring that offtaker commence capacity payments on such date, notwithstanding that Contractor’s failure to finish the Tests on Completion.

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