



## **NON TECHNICAL SUMMARY**

### **SEVAN-HRAZDAN CASCADE REHABILITATION PROJECT REPUBLIC OF ARMENIA**

*Final Version*

41134\_R2\_Eng

October 2012

---

#### **DG Consulting Ltd**

5 Shevardenidze Street, 0177, Tbilisi, Georgia; Reg No 205 280 998;  
Tel: +995 32 397 301; +995 99 500 778;  
e-mail: dgirgvliani@access.sanet.ge

## Introduction

The Sevan-Hrazdan HPP Cascade, comprising seven hydropower plants of 565 MW total nominal capacity, was built in 1930-1965. It is a key part of the Armenian electricity system and urgently needs substantial rehabilitation to ensure safe and stable operation and restore output capacity. The cascade is owned and operated by the International Energy Corporation (IEC).

The IEC and its major shareholder JSC RusHydro intend to invest in rehabilitation of the existing infrastructure in order to improve technical condition of the hydropower facilities included in the cascade and improve the operation characteristics of power generation plants. In order to improve the system, the corporation has prepared the five years development/investment plan and has started implementation of some works based on own resources. Additionally company applied for the loan from banks and has asked EBRD and ADB to support the project.

The banks require that the company's current operations and investment project be in line with the Armenian and EU legal requirements, as well as EBRD's Performance Requirements<sup>1</sup> and ADB's relevant environmental and social policies and requirements<sup>2</sup>. Under the EBRD's Performance Requirement 1 (2008) and the ADB SPS (2009) Safeguards Requirements 4, for the projects involving existing activities and facilities, an Environmental and Social Review is necessary to determine environmental and social risks or impacts and develop mitigation measures to address such risks or adverse impacts. To comply with EBRD and ADB requirements and the outcomes of the Environmental and Social Review, the Environmental and Social Action Plan/Corrective Action Plan and the Stakeholder Engagement Plan have been developed, as well as the present Non-Technical Summary of the findings.

---

<sup>1</sup>The EBRD Environmental and Social Policy and Performance Requirements (PRs) are available on the EBRD website at: <http://www.ebrd.com/downloads/about/sustainability/2008policy.pdf>

<sup>2</sup> ADB's relevant policies include the following: ADB's 2009 Safeguard Policy Statement (SPS), Social Protection Strategy (2001) and Public Communications Policy (2011) which are available from <http://www.adb.org/about/other-operational-policies-and-strategies>

## Description of the Facilities and the Proposed Rehabilitation Project

The Sevan-Hrazdan (SH) HPP Cascade comprises seven small to medium scale hydropower plants, which were built during 1930-1960s. The Cascade spreads over the area from the Sevan Lake to Yerevan City, comprising about 70 km long corridor. In total there are seven power generation plants included in the cascade (Sevan, Hrazdan, Argel, Arzni, Kanaker, Yerevan-1 and Yerevan-3) comprising diversion channels, tunnels, aqueducts, reservoirs, power houses, sub-stations etc. The hydropower system is built on the Hrazdan River and its tributaries. During the irrigation season it receives water from the Sevan Lake as well. In order to maintain and control water level in the Sevan, amount of water supply from the lake is determined by the government each year, based on water availability in the lake and irrigation requirement. Usually 150 mln cubic meters of water is used from Lake Sevan.

As the agriculture is a priority sector in the country and water availability from the Sevan Lake is limited, the operation of the cascade is completely dependent on the country strategy for irrigation. Two first plants of the cascade are operated completely on water released from the Sevan; respectively they work only during irrigation season. The last stage of the Cascade (Yerevan 3), which is built over irrigation system, is also operated during non-irrigation season. The rest four plants are capable to generate power round the year. Total installed capacity of the SH Cascade is 560 MW and mean annual output is around 500 mln kWt/h.

The SH HPP Cascade comprises also a set of open diversion canals and tunnels which transports water from the Sevan Lake to the HPPs. Most of the canals are built in the middle of the last century and nowadays they are deteriorated notably. Due to moral depreciation and technical damages (including illegal connections) the canals are in very poor condition and require major rehabilitation.

No major rehabilitation programs have been implemented at the plants during the lifetime. Respectively, despite routine maintenance works and some relatively small scale rehabilitation projects during the last decade, major part of the hydro power scheme is in poor condition including diversion canals, hydraulic units and sub-stations. Due to this the cascade faces big water losses, instable operations and frequent failure of hydraulic and power generation units, and respectively, its output is reduced to the minimum. To improve the situation and ensure continued safe and stable operation of the SH Cascade and to restore capacity, the IEC has planned the following rehabilitation works:

- reconstruction of Yerevan 1 plant - reconstruction of the weir, replacement of turbines, dredging of the reservoir;
- replacements of much of the electrical equipment in Sevan, Hrazdan, Argel, Arzni and Kanaker HPPs (accumulator battery, generator, excitation equipment, stators)
- reconstruction of diversion canals for Hrazdan, Argel and Arzni HPPs;
- replacements of hydro units in Argel, Hrazdan and Kanaker HPPs.

The planned rehabilitation works will be carried out within the existing HPP facilities, canals/hydraulic structures and property boundaries. Expansion of the existing facilities is not planned.

## Regulatory Requirements

In terms of National legislation, the SH Cascade rehabilitation program does not require the EIA process according to Armenian legislation, considering that all works are planned within the existing HPP facilities, canals/hydraulic structures and property boundaries. Rehabilitation doesn't consider the increase of original capacity of the SH Cascade HPPs. It should be noted also that all facilities have been operational prior to 1995, except of Yerevan-1 reconstruction where reservoir dredging is considered.

Armenian Legislation does not require presence of formalized Environmental and Social management system (ESMS), but has certain requirements for technical safety, environmental permitting, monitoring and reporting. The company periodically undergoes the state ecological inspection, which includes checking of sanitary flow left in the river, visual verification of water pollution with oil, waste management, etc.

In May 2001, Armenia ratified the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (UNECE). The convention is designed to improve the way ordinary people engage with government and decision-makers on environmental matters. Consequently, citizens of Armenia are entitled to be informed about all environment related issues pertaining to the project and it is the responsibility of public authorities, local authorities, or government departments to reveal such environmental information.

In terms of International legislation and banks requirements, as it is stated in the EBRD 2008 Environmental and Social Policy, the EBRD financed projects are expected to meet good international practice related to sustainable development. To help clients and/or their projects achieve this, the Bank has defined specific performance requirements (PR) for key areas of environmental and social issues and impacts, such as Environmental and Social Management; Labour and Working Conditions; Pollution Prevention and Abatement; Community Health, Safety and Security; Land Acquisition and Involuntary Resettlement; Biodiversity Conservation and Sustainable Natural Resource Management; Indigenous Peoples; Cultural Heritage; Information Disclosure and Stakeholder Engagement and other. Each PR defines, in its objectives, the desired outcomes, followed by specific requirements for clients to help them achieve these outcomes. Compliance with relevant national laws is an integral part of all PRs. The EBRD will require clients to structure projects so that they meet all applicable PRs. Central to this is a consistent approach to seek to avoid adverse impacts on workers, communities, and the environment, or if avoidance is not possible, to reduce, mitigate, or compensate for the impacts, as appropriate.

As it is stated in ADB 2009 Safeguard Policy Statement, the objectives of environmental and social safeguard requirements are to:

- (i) avoid adverse impacts of projects on the environment and affected people, where possible;
- (ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- (iii) help clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

To comply with Armenian, EBRD and ADB requirements, as well as international and EU best practice, the Environmental and Social Action Plan/Corrective Action Plan has been developed to minimize, or mitigate adverse environmental and social impacts and to establish proper environmental and social management system within the company (IEC).

## **Company Environmental, Social, Health and Safety (ESHS) Performance**

Currently the company does not have an environmental policy statement and formal environmental and social management system (ESMS) system in place, all issues are managed in accordance with the requirements of old GOST (former Soviet Union standards) and guidelines prepared for operation of HPPs and power substations, as well as requirements of Armenian legislation. The development and implementation of a formalized ESM system including all pertinent documentation and specific plans is recommended in order to ensure compliance with EBRD and ADB requirements. The system should cover whole operation process from the corporate level down to facilities. The system should address all specific issues related to rehabilitation and construction activities. The occupational H&S system should consider improvement in operation processes and appropriate training should be provided. The corporations operation should be in compliance with existing regulations in the employment field, the employment process should be in line with Armenian, International labour organization, EBRD and ADB requirements. The recommendations on the development of proper corporate environmental and social management system are presented in the Environmental and Social Action Plan (ESAP).

Main pollution risks associated with the company performance during operations, such as reservoir management, management of oils and lubricants for turbines, transformers and support infrastructure, management of lead/acid batteries, material and waste management discussed in this report are addressed in the Environmental and Social Action Plan (ESAP) with recommendations for relevant mitigation measures and monitoring.

In terms of protection of the Sevan Lake the IEC and Cascade operations as well as planned activities, it can be concluded that the requirements are met: the fish protection system is working properly and rehabilitation is not planned; neither rehabilitation of other headwork facilities at the Sevan Lake is planned and respectively, the planned project cannot affect the Sevan Lake.

Some environmental impacts are expected from dredging operations of the Yerevan 1 reservoir. This is very important issue which can affect the biological environment downstream from Yerevan 1 dam. The issue should be discussed in detail in EIA study to be performed for reservoir dredging. It is expected that the corporation will employ effective methods for minimization of water quality degradation downstream during the dredging operations. The EIA study should clearly indicate what engineering methods should be employed for working in the river bed.

Among incident risks related to the company operations the flooding downstream dams during river's high water period, or high discharge from spillway to remove water from power house, should be also included. Flooding may also be result of diversion system's failure. Flooding risk mainly endangers population in the neighbourhood of the hydro power scheme, as well as engineered structures located in close proximity to or in the river course. As community safety is a concern during flooding, this issue is addressed in the Environmental and Social Action Plan/ Corrective action Plan in terms of requirement for preparation of Emergency Response Plan.

The negative socio-economic impacts, mostly related to transportation of equipment and materials, are expected to be localized and short-term. All potential negative impacts can be prevented and minimized by implementing appropriate community health, safety and security measures planned to reduce potential impacts and risks for community residents (for instance by providing fences, bridges, ensuring dust control, properly managing community liaison, etc.). These potential risks and

impacts are addressed in Environmental and Social Action Plan (ESAP) through recommendations on corresponding actions and mitigation measures.

### **External Social Performance and Management**

External social performance of the company (IEC) during the implementation of the project and further operations will include community health, safety and security; emergency preparedness and response; management of impacts on vulnerable groups; management of impact on cultural heritage; stakeholders engagement including consultations, disclosure of information and grievance mechanism.

Based on EU best practice and the EBRD PR1, as well as ADB SPS SR1, the Emergency Response Plan shall be part of the properly structured EMS, especially at industrial and infrastructure facilities related to energy production and transportation. The preparation of the Emergency Response Plan (to avoid/mitigate impact from possible accidents on local communities) is included into the ESAP for IEC corporate Environmental Management System (EMS), in particular for rehabilitation and operation of SH Cascade.

Considering that all works are planned within the existing footprint, do not lead to increase of original capacity the SH Cascade rehabilitation doesn't require any additional land acquisition and thus no resettlement or displacement are envisaged within the project. Also no specific impact on vulnerable groups, including indigenous peoples, is expected during construction and operations.

According to the initial planned Scope of Work the rehabilitation works will be organized and implemented within HPPs area and within the ROW of their rehabilitated Canals and Reservoirs, mostly above-ground or inside the existing HPPs' buildings. The infrastructure rehabilitation works will be organized and implemented within canals and reservoirs and within their ROWs that also belong to HPPs. It can be concluded that proposed works will not have any impact on Cultural Heritage. However the development of the chance finding procedure for the contractors and supervisors is included in the ESAP.

Stakeholder engagement and public communication procedures of the IEC related to this project have been reviewed in respect of EBRD's Performance Requirement PR10 and ADB's 2011 Public Communications Policy. The Stakeholder Engagement Plan has been developed for the IEC SH Cascade rehabilitation project, which includes grievance mechanism.

## Summary of ESAP Requirements

Based on findings of the Environmental and Social Review, the Environmental and Social Action Plan (ESAP) has been prepared for the Sevan-Hrazdan Cascade Rehabilitation Project. ESAP includes a series of actions that will be undertaken by International Energy Corporation (IEC) to plan and implement specific measures to avoid, reduce, control and mitigate, or compensate for, the potential environmental, occupational health and safety, and social impacts during rehabilitation and operation of the SH Cascade HPPs and associated structures, assets and infrastructure.

IEC will be reporting periodically on the status of the implementation of each of the required actions to the EBRD and ADB providing status reports on environmental, social and occupational health and safety (ESHS) matters.

The proposed ESAP covers the environmental management planning, mitigation and monitoring of the following issues:

### Section 1: Project-specific actions related to proposed rehabilitation

- Reservoir dredging at Yerevan-1 HPP
- Rehabilitation of diversion channels and tunnels
- Upgrading the power systems and substations

### Section 2: Strengthening of corporate environmental and social management

- Preparation of environmental and social system outline
- Preparation of corporate environmental and social policy document
- Preparation of environmental and social management plan
- Appointment of responsible managers for ESHS issues. Training.
- Preparation of emergency response plan
- Completion of permitting process
- Preparation and implementation of pollution prevention plan, oil management plan, waste management plan
- Establishment of occupational H&S system
- Implementation of stakeholder engagement plan, including grievance mechanism

### Section 3: Project monitoring and reporting

- Establishment of environmental monitoring system
- Establishment of H&S monitoring system
- Preparation of the monitoring reports