HIGH VOLTAGE ELECTRIC NETWORKS CJSC

ARMENIA

REHABILITATION OF "ARARAT-2" SUBSTATION

ENVIRONMENTAL MANAGEMENT PLAN

Final Report

June 2020

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1. BACKGROUND

Electricity Transmission Network Improvement Project (ETNIP), requested by the Government of Armenia, intends to increase the reliability and capacity of the transmission network through rehabilitation/replacement of key transmission assets. To achieve this objective, the ETNIP would include rehabilitation of Ararat-2 substation (SS) of High Voltage Electric Networks CJSC (HVEN). The substation is equipped with three 220kV line bays and 10 110kV line bays. The Installed capacity of two autotransformers is 63 MVA each. Old and obsolete equipment including autotransformers has deteriorated supply reliability and adequacy. The substation's autotransformers easily and quickly heat up due to insufficient cooling capability. In order to prevent severe damages due to extreme temperature, HVEN has been forced to limit electricity consumptions for a certain time period, leading to significant economic losses on especially industrial consumers such as a giant cement factory and a gold refinery, both of which are supplied from the substation. Also, in general, the operation of the transformer at high temperature directly impacts on transformer losses and equipment lifetime. Other equipment is also problematic. The installed oil circuit breakers are outdated technology and should be replaced. As part of the preparatory work for the rehabilitation of Ararat-2 SS, an Environmental Management Plan (EMP) is required.

2. PROJECT DESCRIPTION

Location and site description

The Ararat-2 SS is situated in the north-east of the city of Ararat. Ararat city is located in the central part of Armenia 48km south-east of Yerevan.

The region has a dry continental climate. Summer is hot and dry, the average temperature in July is 26.2^{o}C, and the absolute maximum temperature is 42°C. Winter is cold, the average temperature in January is -3.3^{o}C, and the absolute minimum temperature is -32°C. The average annual temperature is 12.4^{o}C; average wind speed is 1.9m/sec; the average annual relative humidity is 60%; the average annual precipitation is 231mm.

The substation area has poor vegetation cover. Being located in a developed area, there is no wildlife within the project area. The substation site has a nearly flat topography and is surrounded by undeveloped lands to the south-west, west, and north-west. The area adjacent to the north-eastern fencing of the substation is occupied by six land plots with several apricot and mulberry trees and small hovels and barns. There are also two land plots (to the left and right of entrance gate) with several apricot and plum trees and small houses/hovels occupying half of the south-eastern fencing of the substation. These lands are public and land use is unregistered. All fruits are grown by a resident of neighboring communities for personal use.

Ararat gold recovery plant and cement factory are located 100 m north-east and 1 km north-west of the substation respectively. The closest residential area is about 2.5 km far from the substation.

The public road near the substation entrance will be used to access the site from the south-east during construction activities. There is also access to the site from the south-west of substation fencing. No private plots will be crossed by the construction vehicles during rehabilitation works. All construction machinery and equipment will be parked inside the fencing area. The project implementation will not have any temporary or permanent impacts on neighboring businesses.

The substation occupies the fenced area of 4.6 ha with various buildings having the following external dimensions (L×W):

- Control and dispatching building (including offices and battery room): 54×12 m and 6×4 m;
- 6 kV feeder bus section: 18×12 m;
- Storage building: 18×9 m; and
- Checkpoint: 5×6 m.

Project scope of work

The rehabilitation of the substation will involve the following:

- Replacement of 220 kV Open Switch Yard, including disconnectors, surge arresters, voltage transformers, current transformers, busbar conductors, insulator supports, steel structures, cables, and grounding;
- Replacement of 110 kV Open Switch Yard, including disconnectors, surge arresters, voltage transformers, current transformers, busbar conductors, insulator supports, steel structures, cables, and grounding;
- Replacement of 6 kV Indoor Switchgear, including feeders/cubicles and 6 kV outdoor surge arresters, cables and grounding;
- Replacement of 63MVA Autotransformers, 40MVA Boost transformers, 6 kV Shunt Reactors, 400 kVA Auxiliary transformers, including steel structures, cables, and grounding;
- Installation of SCADA system;

- Replacement of Alternating Current and Direct Current (AC/DC) systems, including switchgears, chargers, invertors, and batteries;
- Replacement of relay protection;
- Construction of new cable tranches and replacement of cables;
- Rehabilitation of 6 kV switchgear building;
- Rehabilitation /construction of foundations;
- Rehabilitation of gantries;
- Installation of grounding system;
- Installation of lightning protection system;
- Construction /rehabilitation of oil tanks and oil spill collecting system and installation of new 30m^3 oil tank;
- Rehabilitation of internal roads and walkways;
- Rehabilitation and painting of external fencing, construction of internal fences, replacement of entrance gate and fire protection gates;
- Rehabilitation of substation stormwater drainage and sanitary sewer system;
- Installation of HVAC system;
- Installation of a fire alarm system and GPS system;
- Construction of a new underground 2.8km water pipeline to supply water from an existing pipeline near H8 high way and construction of firefighting pool;
- Replacement of outdoor lighting; and
- Landscaping-greening of the area.

All of these activities, except construction of the water supply pipeline, will take place in the area of an already existing substation (as shown in Figure 1) and all impacts will be confined to the existing substation yard. The water to the substation will be supplied from a well at 1.5km distance from the substation. For installation of water pipeline, the 0.7m wide and 0.8m deep trench will be dug out and promptly reinstated upon closure. The route for underground pipeline lies along the unpaved roadside of public road from the substation to south-west to H8 highway. No private lands will be impacted by the construction of the water supply pipeline. The water pipeline will be laid through community lands, where no land acquisition is anticipated.

Figure 1: Site Plan

3. LEGISLATION

3.1. National environmental legislation

The following Armenian legislation defines a legal framework applicable to project activities:

Law on Atmospheric Air Protection of RoA (1994)

The purpose of Law on Atmospheric Air Protection is to define the main principles of the RoA, directed to the provision of purity of atmospheric air and improvement of air quality, prevention and mitigation of the chemical, physical, biological, and other impacts on air quality and regulation of public relation.

According to this law, the contractor shall undertake demolition and construction activities as well as transportation and temporary storage of wastes the way to minimize dust and other emissions to the air.

Law on Waste of RoA (2004)

The law provides the legal and economic basis for the collection, transportation, disposal, treatment, re-use of wastes as well as prevention of negative impacts of waste on natural resources, human life, and health. The law defines the roles and responsibilities of the state authorized bodies as well as of waste generator organizations in waste management operations.

According to Article 12 and 13 of the law, hazardous waste producers should develop and approve waste passports to be conformed with the Ministry of Environment.

According to this law, the waste generated by the demolition, construction, dismantling, and installation activities should be recycled as appropriate, or disposed of in designated locations.

Law on Environmental Impact Assessment and Expert Examination of RoA (2014)

The law defines the type of activities which are subject to environmental impact assessment and expert examination.

According to this law, works planned at Ararat-2 SS are not subject to environmental impact assessment and expert examination.

Law on Urban Development of RoA (1998)

According to this law, works planned at Ararat-2 SS require obtaining the construction permit.

The specific legal acts and regulatory measures governing rehabilitation works at substation are as follows:

- Technical Specifications for “Requirements to power distribution units and substation equipment” (Governmental Decree #1033-N, 04.09.2008);
- Technical Specifications for “Electric power distribution” (Governmental Decree #961-N, 12.07.2007);
- Technical Specifications for “General requirements to electric power units equipment” (Governmental Decree #1943-N, 21.12.2006);
- Construction norms for “Fire safety of buildings and structures” (HHShN 21-01-2014).

3.2. World Bank's Safeguard Policies and their relevance to the project

The Project triggers the World Bank's safeguard policies OP 4.01 Environmental Assessment and BP 17.50 Disclosure Policy and OP 4.12 Involuntary Resettlement. According to OP 4.01, ETNIP is classified as environmental Category B. Activities to be undertaken at the Ararat substation also qualify for Category B. The present EMP is prepared following the World Bank's safeguard policies.

The WBG Environmental, Health and Safety (EHS) Guidelines also apply and are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). More specifically, EHS Guidelines on Electric Power Transmission and Distribution are applicable to works at the Ararat substation.

4. PUBLIC CONSULTATIONS

The neighboring communities of Ararat-2 SS are considered to be the affected parties during the construction and operational phases. The EMP will be disclosed on the website of the HVEN and opened for public feedback. Brief information on the planned works and contact information for addressing questions and grievances will be placed at the worksite and/or in its immediate surroundings/municipality.

For effective and prompt resolution of disagreements and grievances, a Grievance Redress Mechanism has been developed and presented during public consultations. It is also provided in the Project information brochure. The first stage of the Grievance Redress Mechanism involves resolving grievances at the community and contractor level. Grievances/ complaints are collected by an authorized person in the given community and contractor and handed over to the Grievance Coordinator at HVEN. Complainants may also approach the HVEN grievance coordinator in person. If HVEN is not able to address the issues raised by immediate corrective action, a long-term corrective action will be identified. The complainant will be informed about the proposed corrective action and follow-up of corrective action within 25 calendar days upon the acknowledgement of grievance. In situation when HVEN is not able to address the particular issue verified through the grievance mechanism or if action is not required, it will provide a detailed explanation/ justification on why the issue was not addressed. The response will also contain an explanation on how the person/ organization that raised the complaint can proceed with the grievance in case the outcome is not satisfactory. At all times, complainants may seek other legal remedies in accordance with the legal framework of Armenia. Consequently, if the grievance resolution fails, the complainant can take the case to the court.

5. POTENTIAL IMPACTS AND MITIGATION MEASURES

The EMP covers environmental and social impacts that may arise from the project implementation and provides mitigation measures to cover typical impacts from upgrading equipment and installing new equipment at substations, including workers' health and safety, earthworks, and solid and hazardous waste management. Environmental Management Program provided in Annex 1summarizes the anticipated environmental impacts and provides details on the measures responsibilities to mitigate these impacts and the ways in which implementation and effectiveness of the measures will be monitored and supervised.

Waste management and labor safety issues are the most challenging tasks of the environmental mitigation plan developed for the project.

Direct impacts on health and safety during the planned construction/rehabilitation works may result from various factors such as working at heights, crane/bulldozer operations, handling of hazardous materials, welding works, and sanitary conditions during civil works, etc. A potential impact on the health and safety of workers could be further related to work accidents during civil works (fall of structures), possible occurrence of poisonous snakes during working, or due to contaminated drinking water or food. The personnel should be provided by appropriate protective equipment (PPE) (dust, noise, etc.). Prior to starting civil works, training shall be provided to workers regarding working at heights, electrical safety, vehicular safety, handling of hazardous materials, PPE, use of first aid and rescue techniques, emergency response, poisonous snakes, etc. Also, it is necessary to carry out the routine inspection of the machinery and equipment for troubleshooting, and training and instruction of the workers engaged in maintenance of the machinery, tools, and equipment on safe methods and techniques of work.

The main types of wastes expected at the construction phase are: (i) non-hazardous - demolition debris; other types of non-hazardous construction waste; excess material from excavation; obsolete equipment; and (ii) hazardous – lead batteries; asbestos waste; used transformer oils; used mercury vapor lamps; used tires, filters, and oils of construction machinery and vehicles.

Non-hazardous - demolition debris and other as well as asbestos waste will be disposed to the designated landfill of Ararat city. To avoid the health hazards of workers and environmental pollution with asbestos waste it is necessary to: (i) ensure proper use of personal protective gear by all workers and personnel exposed to hazardous materials; (ii) avoid unnecessary fragmentation of asbestos-containing parts of the buildings while demounting and sprinkle them in advance; (iii) keep asbestos-containing construction waste in a separate and especially isolated location of the worksite and timely remove it to the formally designated disposal site using covered vehicles.

Excess material from the excavation will be disposed of to the formally designated locations. Permission for disposal from the Ararat Municipality shall be obtained by Construction Contractor prior to disposal.

Obsolete equipment will be stored at the Ararat-2 SS site before being sold or possible reuse by HVEN.A separated outdoor area in 220 kV Switch Yard of the SS plot will be used as decommissioned equipment storage.

The maintenance of construction machinery and vehicles will be performed at specialized service centers, which also accept used tires, filters, and oils.

Transformer oils at Ararat-2 SS were assessed by the Waste Research Center SNCO of the Ministry of Environment of RoA in 2010 using the DEXSIL L2000 DX analyzer. According to assessment results, the transformer oils at Ararat-2 SS do not contain PCBs. Since at present there is no local licensed recycling facility, the used oils will be stored at this SS in an appropriate storage space before recycling by a licensed contractor. The storage area will be sealed and surrounded by a concrete bund to hold at least 110% of the contents of the tank(s) in case of a rupture and to exclude soil/groundwater pollution. The storage tank will have supports that keep the tank high enough off the ground to be visually inspected. The tank will be maintained in good condition, free of any rust or corrosion.

As the disposal of used lead batteries in a landfill is prohibited, once decommissioned, the batteries must be transported and recycled by a licensed contractor. The list of licensed organizations specialized in hazardous waste transportation, storage, recycling, neutralization, and disposal is published on the RoA Ministry of Environment website: http://www.mnp.am/en/pages/182. Proper personal protection gear will be used by personnel when handling the lead batteries.

Since the disposal of used mercury vapor lamps in a landfill is impossible and also at the moment there are no local recycling/neutralization facilities, the lamps will be stored unbroken at Ararat-2 SS until such kind of facilities will be established. All mercury-containing lamps will be separated from other types of waste generated at the substation and placed in their packages then inside a larger container with a tight-fitting lid and full labeling (details of composition, properties, and handling information).The storage conditions will include locked room with the shelves for placement of containers.

The replaced generating circuit breakers will be state-of-the-art SF6 circuit breakers. The amount of SF6 gas is very small and possible leakages are controlled automatically. Thus the risk of any SF6 release to the environment is minimal.

The EMP establishes a critical link between the management and mitigation measures specified in this report and the proper implementation and management of the measures during the construction and operation phases of the project.It provides details on the

measures responsibilities to mitigate these impacts; the costs of mitigation; and, the ways in which implementation and effectiveness of the measures will be monitored and supervised.

6. RESPONSIBILITIES AND INSTITUTIONAL ARRANGEMENTS

HVEN is responsible for ensuring the implementation of the EMP. HVEN will formally approve this document and will manage all aspects related to the implementation of the environmental management plan. The environmental management plan table, extracted from this EMP, will be included into the tender package and will be incorporated into the contract for the provision of works, so that contractor is aware of the mitigation measures to be applied, can properly cost them and include into the bill of quantities, and is obligated to adhere to the EMP alike any other terms of the contract.

An EHS specialist is employed within HVEN. The EHS will carry out the overall supervision of the implementation of the EMP, reveal and report on incompliance with the EMP or issues that may arise in the course of construction works that had not been covered in the EMP, develop a time-bound plan of corrective actions to address issues revealed / damage done and recommend it to the administration of HVEN, and follow up to track and oversee progress towards alleviation of problems.

HVEN will monitor implementation of mitigation measures and good practices prescribed by this document using its in-house capacity as well as hired qualified environmental and/or social consultants and in case of revealing shortfalls, will notify project contractors/beneficiaries on the outstanding issues and request remedial action. If incompliance persists, and requirements of EMP are severely infringed, HVEN will undertake penalty actions established for violation of the terms of contract.

Responsibilities of HVEN and Contractors

HVEN shall obtain Construction Permit for the designed works as well as Technical Specifications for the connection to the existing water distribution pipeline. HVEN has already developed and approved wastes passports, conformed with the Ministry of Environment for all types of hazardous wastes.

Design and construction contractors should hold licenses for the development of design documentation and implementation of construction activities. Construction contractor should have specially assigned staff responsible for the EMP implementation during the construction phase. Compliance with the EMP is mandatory for all contractors and beneficiaries.

Any occupational health and safety (OHS) incidents that may occur at the project site must be immediately reported to the World Bank without postponing that till a regular progress report is due. Towards this end, HVEN must include the requirement to promptly report on OHS incidents into the contracts signed with the contractors of works and work supervision

consultants. Once a notice on an OHS incident arrives at the HVEN, it must be instantly communicated to the World Bank with the inclusion of sufficient detail known at the moment of reporting.

Monitoring of EMP implementation

HVEN carries overall responsibility for the implementation of EMP and for organizing environmental monitoring of works. Environmental monitoring of works shall be undertaken according to the Environmental Monitoring Plan presented in this report and the outcomes of monitoring shall be documented in monthly environmental supervision reports. HVEN is also responsible for producing regular narrative reports on the outcomes of monitoring. These reports will summarize findings of field work, analyze common issues encountered, explain the nature of remedial actions worked out for addressing issues, and assess status of remedial actions undertaken upon recommendation issues under a previous report period.

HVEN will produce reports on the status of environmental and social compliance prior to the project implementation support missions to be undertaken by the World Bank. Analytical information of the safeguards compliance will be part of the ETNIP bi-annual progress reports too. Reports will be supplemented with dated photo documentation. All field monitoring checklists and narrative reports will be stored in the electronic and/or hard format at HVEN in a systemic manner and shall be made available to the World Bank upon request.Regular progress reports should include information on any OHS incidents that have occurred in the reporting period, along with follow-up action undertaken. If no incidents have occurred, every progress report should state so.

ANNEX 1: ENVIRONMENTAL MANAGEMENT PROGRAM

ENVIRONMENTAL MANAGEMENT PLAN

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
CONSTRUCTION PHASE					
1. General conditions	Risk of environmental non-compliance during project implementation	1. Development and implementation of a general Construction EMP (in line with the present EMP); 2. Development and implementation of following risk-specific management plans: - Occupational Health and Safety (OHS) Management Plan to assist the management of activities and support a risk-based approach to preventing dangerous acts that could lead to injuries or illnesses or serious incidents in the workplace; - Hazardous Waste Management Plan (including ACM), describing the proper handling, labeling, storage, record keeping and transportation practices and procedures to be followed by people working with hazardous waste to assist in protecting them from potential health and physical hazards presented by	- Construction EMP is available and enforced; - OHS Management Plan, Hazardous Waste Management Plan, Emergency Preparedness and Response Plan, and Traffic Management Plan are available and enforced during the construction.	Included in project costs	Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
		hazardous materials present in the workplace, and to keep chemical exposures below specified limits.; - Emergency Preparedness and Response Plan (including spills response), describing a standardized response and recovery protocol to prevent, minimize, and mitigate injury and damage resulting from emergencies or disasters of man-made or natural origin; - Traffic Management Plan, outlining the Contractor's commitment to preventing injuries caused by mobile plant/vehicle interaction with people and establishing controls to minimize the risk of personal injury and damage due to those interactions.			
3. Emergency preparedness	Risk to the health and safety of staff and neighboring communities	- Emergency Preparedness and Response Plan in place; - Provision of first aid kits and fire extinguishers at SS site andin all vehicles; - Personnel trained in the emergency response; - Identifying area emergency responders, hospitals, and clinics, and providing advance notice ofProject activities.	- Availability of first aid kits and fire extinguishers; - Presence of training records; - Area emergency responders informed about Project activities.	No specific extra cost: common responsibility of works contractor	Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
4. Labor safety	Traumatism and accidents at work site during crane/excavators/ bulldozers operations	- Provision of construction workers with uniforms and PPE; - Strict compliance with the national regulations on crane/excavators/ bulldozers operations; - Carrying out of works under the supervision of electricians while approaching to the overhead electrical lines under tension; - Installation and fixation of cranes in a stable position to prevent their tipping or spontaneous displacement under the action of its own weight, and the engine; - Checking the serviceability of machinery, availability of their fencing and safety devices for mechanized management of earthworks. Prohibiting working on defective machines; - Provision of workers serving machines with instructions, comprising following: (a) machine controlling instruction and caring about the workplace; (b) safety engineering requirements; (c) guidance of signals system; (d) the maximum loads and speeds of machines; (e) the measures have to be taken by	- Construction workers found wearing uniforms and adequate protective gear during inspections; - No violations of equipment operation and use instructions and regulations registered during inspections; - Machines are controlled only by specially trained personnel having a certificate of competence of controlling machines; - Presence of site induction and training records.	No specific extra cost: common responsibility of works contractor	Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
		the worker in the case of accident or malfunction of the machines; - Strict compliance with the safe operating rules of relevant machines; - Allowing only specially trained personnel having certificate of competence of controlling machines to control the machines; - Strict compliance with the following basic requirements of cranes and bulldozers operations: (a) all rotating parts of machines - gears, chain and temporary transfer, fans, flywheels, etc. must be fenced by casing. Turning on the mechanisms without fences is prohibited; (b) examination, adjustment, tightening bolts, lubrication and preventive maintenance of the equipment during their work is banned; and (c) in areas where these machines work implementation of any other works and existence of people are not allowed. If in exploit soil will be found large stones, stumps or other objects the machine must be stopped and the objects which can cause an accident should be removed.			

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
	Traumatism and accidents at work site during welding works	- Strict compliance with the national regulations on welding works; - Provision of welding workers with protective equipment, rubber gloves, special boots, and helmets; - Provision of labor safety training to all workers prior to starting welding operations; - Strict compliance with the usage of protective gear which as minimum includes: (a) respirator/welders mask; (b) protective clothing: all skin areas need to be protected to protect against molten metal and sparks. This includes: long sleeve shirts; pants that cover the tops of shoes; gloves; shoes or boots; (c) eye protection devices against injuries from debris and from the effects of the ultraviolet light; (d) helmets; - Strict compliance with the fire safety requirements prepare and use extinguishers as well as sand and water.	- Welding workers found wearing uniforms and adequate protective gear during inspections; - No violations of regulations on welding works registered during inspections; - Labor safety training records available on site; - Presence of basic fire extinguishing means on site.	No specific extra cost: common responsibility of works contractor	Construction Contractor
	Traumatism and accidents at work site during dismantling/installing electrical equipment	- Provision of workers engaged in dismantling/installing electrical equipment with uniforms and PPE; - Strict compliance with the national regulations on conducting	- Workers found wearing uniforms and adequate protective gear during inspections; - No violations of regulations on conducting dismantling/installing	No specific extra cost: common responsibility of works contractor	Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
		dismantling/installing electrical equipment; - Organize training and instruction of the workers engaged in maintenance of the machinery, tools and equipment on safe methods and techniques of work; - Prohibiting distribution of faulty or unchecked tools for work performance as well as leaving off-hand mechanical tools connected to the electrical supply network or compressed air pipelines; prohibiting pulling up and bending of the cables and air hose pipes; prohibiting laying cables and hose pipes with their intersection by wire ropes, electric cables, handling the rotating elements of power driven hand tools.	electrical equipmentregistered during inspections; - Labor safety training and instruction records for workers engaged in dismantling/installing electrical equipmentavailable on site; - No violations of equipment and tools operation and use instructions registered during inspections.		
5. Demolition and construction	Air pollution with dust and emissions	- Keeping demolition debris in controlled area and spraying with water mist to reduce debris dust; - Suppression of dust during pneumatic drilling/wall destruction by ongoing water spraying and/or installing dust screen enclosures at site; - Keeping the surrounding environment (sidewalks,	- No demolition debris found in uncontrolled area and unsprayed with water; - No pneumatic drilling/wall destruction activity without suppression of dust by ongoing waster spraying and/or installing dust screen enclosures at site; - Surrounding environment (sidewalks, roads) found	No specific extra cost: common responsibility of works contractor	Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
		roads) free of debris to minimize dust; - Prohibiting open burning of construction / waste material at the site; - Keeping construction vehicles and machinery in adequate technical condition excluding excessive emissions; - No idling of construction vehicles at sites.	free of debris during inspections; - No open burning of construction / waste material found at the site during inspections; - During inspections, construction vehicles and machinery found operating without excessive emissions; - No complaints from nearby residents.		
	Generation of noise	- Respecting working hours: 9 AM-6 PM; - Closing the engine covers of generators, air compressors and other powered mechanical equipment during operations, and placing of equipment as far away from residential areas as possible; - Fitting noise mufflers to mobile plant and equipment; - Preventative maintenance of equipment to minimize noise; - Switching off unnecessary or idle equipment.	- No construction equipment found operational out of working hours; - Construction equipment found in decent technical condition during inspections; - No switched on unnecessary or idle equipment found during inspections; - No complaints from nearby residents.	No specific extra cost: common responsibility of works contractor	Construction Contractor
6. Provision of construction materials	Delivery of substandard materials which may cause risks to the safety of structure and to health of people	Purchase of construction materials from the registered providers	Delivery of standard quality construction materials carrying relevant certificates of origin	None	Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
7. Transportation of construction materials and waste Movement of construction machinery	- Pollution due to poor technical condition of vehicles and movement of uncovered truckloads; - Nuisance to local residents from noise and dust.	- Adequate technical condition of vehicles and machinery; - Confinement and protection of truck loads with lining; - Define routes and staging areas; - Respect of the established hours and routes of transportation.	- Vehicles and machinery found in decent technical condition during inspections; - No uncovered truck loads found during inspections; - No activity ongoing out of working hours which may be disturbing for nearby population; - No complaints from nearby residents.	No specific extra cost: common responsibility of works contractor	Construction Contractor
8. Operation of construction equipment on site	- Pollution of environment with emissions and leakages; - Nuisance for nearby population.	- Adequate technical condition of construction equipment; - No excessive exhaust; - No fuel and lubricant leakage; - Observation of working hours (9 AM-6 PM); - Implementation of spills response plans	- Vehicles and machinery found in decent technical condition during inspections; - No heavy vehicles and machinery found operational out of the established hours; - No complaints from the nearby population; - Spills response plans are in place.	No specific extra cost: common responsibility of works contractor	Construction Contractor
9. Maintenance of construction equipment	- Pollution of ground water and soil with oil products due to operation of equipment; - Damage in case of fire.	- Washing of cars and construction equipment outside the construction site or on maximum distance from natural streams; - Refueling or lubrication of construction equipment at predetermined filling stations/service centers; - Provision of spill kits on-site for the clean-up of spills and leaks of oil;	- No direct entry of runoff from car-wash to water bodies; - No spillages of fuel and lubricants found on the ground within and nearby the construction site; - Presence of basic fire extinguishing means on site; - Presence of spill kits on-site.	No specific extra cost: common responsibility of works contractor	Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
		- Preventing leakage and spillage of oil during maintenance; - Timely cleaning any oil leakages and accidental spillages.			
10. Earth works	- Loss of vegetation due to ground piling and minimization of pollution of surface water body with particles.	- Topsoil removal and temporary stockpiling for re-cultivation of the land; - Temporary storage of excavated soil at determined places; - Backfilling of the excavated ground as needed and disposal of the excess mass to the places, approved in writing.	- Excess material disposed at the agreed upon safe permanent storage sites with no threat of erosion and no blocking of waterways; - No remnants of excess material at the construction site upon completion of works.	Contractor has to include the cost of transportation of excess material to the sites of final disposal into the bill of quantities.	Construction Contractor
11. Generation of non-hazardous construction waste	- Pollution of soil, surface water and ground water; - Accidents at construction site due to scattered fragments of construction materials and debris; - Deterioration of esthetic appearance of construction site and its surroundings.	- Implementation of the Hazardous Waste Management Plan; - Temporary storage of construction waste in especially allocated bunded/lined areas within the fenced area of SS; - Written agreement on the disposal of excess material and construction waste obtained from the Municipality of Ararat; - Timely disposal of wastes to the formally designated locations.	- Construction waste found at the work site piled up in designated locations; - No excessive amount of construction waste stored on site; - Adequate record keeping.	Contractor shall include cost of waste transportation/disposal into the bill of quantities.	Ararat Municipality Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
12. Generation of non-hazardous liquid wastes	- Pollution of surface and ground water; - Deterioration of sanitary conditions at work site.	Arrangement and maintenance of toilets in compliance with sanitation norms at the construction site.	Toilets provided at the construction site and found in good sanitary condition	No specific extra cost: common responsibility of works contractor	Construction Contractor
13. Generation of waste from the removal of used transformer oils and obsolete equipment	- Pollution of soil, surface water and ground water; - Accidents at construction site due to scattered decommissioned; materials and equipment; - Deterioration of esthetic appearance of construction site and its surroundings.	- Implementation of Emergency Preparedness and Response Plan (including spills response); - Temporary storage of decommissioned equipment on the site of Ararat-2 SS in especially designated locations; - Safe storage of transformer oils at Ararat-2 SS; - Checking for oil leaks regularly.	- Decommissioned equipment found at Ararat-2 SS site collected in designated locations; - Replaced transformer oils found in proper storage at Ararat-2 SS; - No spillages of oil found on the ground within and nearby the storage area.	To be included in the SSs' operation and maintenance budget	Construction Contractor HVEN
14. Generation of asbestos containing construction waste from roof replacement	- Pollution of soil, surface water and ground water; - Health hazards to construction workers and other people which may enter the construction site; - Health hazards to waste disposal workers and other people which may enter waste disposal site.	- Implementation of the Hazardous Waste Management Plan; - Provision of ACM Handling training to workers before the start of work; - Removal of asbestos-containing roof sheets with minimal fragmentation to avoid dust generation; - Watering of roof sheets during removal to minimize dust generation; - Temporary storage of removed roof sheets under a cover in a designated location within the fenced area of SS;	- ACM Handling training records available on site; - Asbestos-containing construction waste found at the work site piled up in designated locations; - Asbestos-containing waste found at the work site separated from other waste; - No excessive amount of asbestos-containing construction waste stored on site; - Personnel handling asbestos-containing waste found wearing uniforms and protective gear	Contractor shall include the cost of asbestos-containing waste transportation/disposal into the bill of quantities.	Ararat Municipality Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
		- Timely removal of roof sheets to the designated disposal site in a covered truck; - Covering of asbestos-containing waste with a layer of earth at the site of its final disposal; - Wearing uniforms and protective gear (eyeglasses and respirators) by personnel handling asbestos-containing waste at any stage.	(eyeglasses and respirators) during inspections.		
15. Generation of toxic waste from replacement of batteries	- Pollution of soil, surface water and ground water due to leakage or spillage of acid from old equipment; - Health hazards to construction workers and other people which may enter the construction site; - Health hazards to workers and other people which may enter waste storing site.	- Implementation of the Hazardous Waste Management Plan; - Strict separation of toxic waste (used lead batteries, etc.) from other types of waste generated at the substation; - Preparation of toxic waste for temporary storage through placement in containers and full labeling (details of composition, properties and handling information); - Preparation of premises for temporary storage of toxic waste (provision of non-permeable flooring, ventilation systems, security systems, etc.); - Safe and secure temporary storage of toxic waste.	- Hazardous waste found at the work site separated from other waste; - Hazardous waste found at the Ararat-2 SS stored in safe containers with a tight-fitting lid and labeled with details of composition, properties and handling information.	To be included in the SS's operation and maintenance budget	Construction Contractor HVEN

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
16. Generation of toxic waste from the replacement of mercury vapor lamps	- Pollution of soil, surface water and ground water due to release of mercury from replaced lamps into the environment; - Health hazards to construction workers and other people which may enter the construction site; - Health hazards to workers and other people which may enter waste storing site.	- Implementation of the Hazardous Materials Management Plan; - Strict separation of used mercury vapor lamps from other types of waste generated at the substation; - Preparation of toxic waste for storage through placement in containers with a tight-fitting lid and full labeling (details of composition, properties and handling information); - Safe and secure storage of mercury lamps.	- Hazardous waste found at the work site separated from other waste; - Hazardous waste found at the Ararat-2 SS in safe containers with a tight-fitting lid and labeled with details of composition, properties and handling information.	To be included in the SS's operation and maintenance budget	Construction Contractor HVEN
17. Construction site re-cultivation and landscaping	Loss of aesthetical value of the landscape due to rehabilitation of the SS	- Dismantlement of construction base (if any) and temporary access roads to the site (if any) and harmonization of the areas with the landscape; - Final cleaning of the construction site and permanent access roads and landscaping-greening of the area.	- No remnants of a work camp left behind after demobilization of contractor; - Temporary access roads harmonized with landscape and enabling conditions provided for natural regeneration of vegetation; - Construction site landscaped and greened.	Included in project costs	Construction Contractor
18. Traffic and Pedestrian Safety	Direct or indirect hazards to public traffic and pedestrians by construction activities	- Implementation of the Traffic Management Plan; - Signposting, warning signs, barriers and traffic diversions; - Traffic management system and staff training, especially for site access and near-site heavy traffic. Provision of safe passages and crossings for	- Properly secured construction site; - Clearly visible site and the public warned of all potential hazards; - Regulated construction-related traffic.	Included in project costs	Construction Contractor

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
		pedestrians where construction traffic interferes; - Adjustment of working hours to local traffic patterns, e.g. avoiding major transport activities during rush hours; - Active traffic management by trained and visible staff at the site, if required for safe and convenient passage for the public.			
OPERATION PHASE					
1. Generation of hazardous waste (oily rags, oil-contaminated sand)	- Health hazards to SS staff; - Pollution of soil, surface and ground water in SS area and its surroundings.	- Development and implementation of the Hazardous Waste Management Plan; - Separation of hazardous waste from other types of waste generated at substation; - Presence of appropriately sealed and protected storage area for hazardous substances; - Arrangements in place with especially licensed entities for regular out-transporting and recycling/disposal of hazardous waste in compliance with the national legislation and the best national practice.	- Hazardous Waste Management Plan is available and enforced during the operation; - Good sanitary conditions in and around SS.	To be included in the SS's operation and maintenance budget	HVEN
2. Operation and maintenance of SS equipment	Pollution of soil, surface and ground water in SS area and its surroundings	- Availability of spill kits on-site for the clean-up of spills and leaks of oil;	Good sanitary conditions in and around SS	To be included in the SS's operation and maintenance budget	HVEN

Activity	Potential Impact	Mitigation Measure	Indicator of Mitigation	Cost of Mitigation	Responsibility for Mitigation
		- Preventing leakage and spillage of oil during operation and maintenance; - Timely cleaning any oil leakages and accidental spillages.			
3. Emergency preparedness	Disruption of the SS operation causing nuisance to the consumers	Presence of fire alarm and fire localization system, and emergency back-up systems for power supply	Smooth operation of the SS	To be included in the SS's operation and maintenance budget	HVEN

ENVIRONMENTAL MONITORING PLAN

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
CONSTRUCTION PHASE						
1. General conditions	- Availability and enforcement of Construction EMP, OHS Management Plan, Hazardous Waste Management Plan, Emergency Preparedness and Response Plan, and Traffic Management Plan	Construction site	Inspection of documents; Inspection of activities	Periodically during construction and upon its completion	Ensure compliance with the specified by national legislation and EMP environmental requirements	HVEN
2. Provision of construction materials	Purchase of construction materials from the registered providers	In the provider's office or warehouse	Verification of labels of the materials and/or certificates if any	During conclusion of supply contracts	Ensure reliability of construction materials and their safety for human health	HVEN
3. Transportation of construction materials and waste Movement of construction machinery	- Technical condition of vehicles and machinery; - Confinement and protection of truck loads with lining; - Respect of the established hours and routes of transportation.	- Construction site; - Routes of transportation of construction materials and wastes.	Inspection of roads adjacent to the SS in the direction of the movement route	Selective inspections during work hours	- Limit pollution of soil and air from emissions; - Limit nuisance to local communities from noise and vibration; - Minimize traffic disruption.	HVEN Traffic Policeof RoA
4. Dust	Air condition on-site	Construction site and access road	Visual inspection	Recurrent	Reduce risks for the staff and neighboring communities	HVEN
5. Noise	- Observance of working hours: 9AM-6PM; - Technical condition of vehicles and machinery; - Noise levels (in case of complaints).	Construction site	- Visual inspection; - Instrumental measurement of noise levels (in case of complaints)	- Recurrent - Within 2 weeks following a complaint	Reduce nuisance for staff and neighboring communities	HVEN

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
6. Maintenance of construction equipment	- Washing of cars and construction equipment outside the construction site or on maximum distance from natural streams; - Refueling or lubrication of construction equipment at the predetermined filling stations/service centers; - Provision of spill kits on-site for the clean-up of spills and leaks of oil; - Preventing leakage and spillage of oil during maintenance; - Timely cleaning any oil leakages and accidental spillages.	Construction site	Inspection of activities	Selective inspections during work hours	- Avoid pollution of water and soil with oil products due to operation of equipment; - Timely localize fire and decrease possible damage.	HVEN
7. Earth works	- Topsoil removal and temporary stockpiling for re-cultivation of the land; - Temporary storage of excavated soil at determined places; - Backfilling of the excavated ground as needed and disposal of the excess mass to the places, approved in writing.	Construction site	Inspection of activities	During earth works	- Limit loss of vegetation due to ground piling and minimization of pollution of surface water reservoirs with particles; - Limit pollution with contaminated soil of surface and ground waters.	HVEN
8. Generation of non-hazardous construction waste	- Temporary storage of construction waste in especially allocated bunded/lined areas within the fenced area of SS; - Written agreement on the disposal of excess material and	Construction site; Waste disposal site	Inspection of activities Inspection of documents	Periodically during construction and upon its completion	- Prevent pollution of soil, surface water and ground water; - Avoid accidents at the SS site due to scattered	HVEN Ararat Municipality

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
	construction waste obtained from the Municipality of Ararat; - Timely disposal of wastes to the formally designated locations.				fragments of construction materials and debris; - Retain esthetic appearance of the sites area and its surroundings.	
9. Production of liquid wastes	- Arrangement and maintenance of toilets in compliance with sanitation norms at the construction site	Construction site	Inspection of activities	Total period of construction	Reduce pollution of surface and ground waters	Construction Contractor
10. Generation of waste from the removal of obsolete equipment	- Temporary storage of decommissioned equipment in especially designated location of Ararat-2 SS.	Land plot of Ararat-2 SS	Inspection of activities	Periodically during construction and upon its completion	- Prevent pollution of soil, surface water and ground water; - Avoid accidents at the construction site due to scattered decommissioned materials and equipment; - Retain esthetic appearance of the SS area and its surroundings.	HVEN
11. Generation of waste from replacement of transformer oils	Storage conditions of oils at Ararat-2 SS	Ararat-2 SS	Visual inspection	Periodically during storage of oils	Avoid pollution of soil and water	HVEN
12. Generation of asbestos-containing construction waste from roof replacement	- Provision of ACM Handling training to workers before the start of work;	Construction site;	Inspection of activities Inspection of training records	Periodically during construction and upon its completion	- Prevention of health hazards to construction workers and other	HVEN Ararat Municipality

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
	- Removal of asbestos containing roof sheets with minimal fragmentation to avoid dust generation; - Watering of roof sheets during removal to minimize dust generation; - Temporary storage of removed roof sheets under a cover in a designated location within the fenced area of SS; - Timely removal of roof sheets to the designated disposal site in a covered truck; - Covering of asbestos containing waste with a layer of earth at the site of its final disposal; - Wearing uniforms and protective gear (eyeglasses and respirators) by workers and personnel handling asbestos containing waste at any stage.	Waste disposal site			people which may enter the construction site; - Prevention of health hazards to waste disposal workers and other people which may enter waste disposal site.	
13. Generation of toxic waste from replacement of batteries	- Strict separation of toxic waste (used lead batteries, etc.) from other types of waste generated at the SS; - Preparation of toxic waste for temporary on-site storage through placement in containers and full labeling (details of composition, properties and handling information); - Preparation of premises for on-site storage of toxic waste	- Premises of the Ararat-2 SS	Visual inspection	- During transportation of toxic waste; - Periodically during storage of toxic waste.	Avoid pollution of soil and water	HVEN Inspectorate for Nature Protection and Mineral Resources

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
	(provision of non-permeable flooring, ventilation systems, security systems, etc.); - Safe placement of toxic waste for temporary storage.					
14. Generation of toxic waste from replacement of mercury vapor lamps	- Strict separation of used mercury vapor lamps from other types of waste generated at the SS; - Preparation of toxic waste for storage through placement in containers with a tight-fitting lid and full labeling (details of composition, properties and handling information); - Safe placement of mercury lamps for storage.	- Premises of the Ararat-2 SS.	Visual inspection	- Periodically during storage of toxic waste.	Avoid pollution of soil and water	HVEN Inspectorate for Nature Protection and Mineral Resources
15. Construction site re-cultivation and landscaping	- Dismantlement of construction base (if any) and temporary access roads to the site (if any) and harmonization of the areas with the landscape; - Final cleaning of the construction site and permanent access roads and landscaping-greening of the area.	Construction site, access roads	Inspection of activities	Final period of construction	Reduce loss of aesthetical value of the landscape due to rehabilitation of the SS	HVEN
16. Workers' health and safety	- Construction workers wearing uniforms and PPE; - Strict compliance with the rules of construction equipment operation and usage of PPE;	Construction site	Inspection of activities	Total period of works	Reduce probability of traumas and accidents to constructors	HVEN

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
	- Strict compliancewith the national regulations forconstruction works; - Presence of basic fire extinguishing means; - Availability of labor safety training and instruction records.					
OPERATION PHASE						
1. Hazardous waste management (oily rags, oil-contaminated sand)	- Separation of hazardous waste from other types of waste generated at substation - Presence of appropriately sealed and protected storage area for hazardous substances; - Arrangements in place with especially licensed entities for regular out-transporting and disposal of hazardous waste in compliance with the national legislation and the best national practice.	Premises of SS	- Inspection of SS - Checking presence and validity of waste removal and disposal agreement with a licensed entity.	Total period of operation of the SS	- Maintenance of good sanitary conditions at SS; - Limitation of soil, surface and ground water pollution.	Inspectorate for Nature Protection and Mineral Resources Ministry of Territorial Administration and Infrastructure
2. Operation and maintenance of SS equipment	- Availability of spill kits on-site for the clean-up of spills and leaks of oil; - Preventing leakage and spillage of oil during operation and maintenance; - Timely cleaning any oil leakages and accidental spillages.	SS area	Inspection of SS premises	Total period of operation of the facility	- Prevention of health hazards to staff and other people which may enter the site; - Avoid pollution of water and soil with oil products due to maintenance and operation of equipment;	HVEN Ministry of Territorial Administration and Infrastructure

Activity	What (Is the parameter to be monitored?)	Where (Is the parameter to be monitored?)	How (Is the parameter to be monitored?)	When (Define the frequency / or continuous?)	Why (Is the parameter being monitored?)	Who (Is responsible for monitoring?)
					- Timely localize and decrease expected damage in case of fire.	
3. Electric and Magnetic Field	Electric and Magnetic Field intensity	In the area of operation and at the fence	Electro meter and Gauss meter	Six monthly	Reduce risks for the staff and neighboring communities	HVEN Ministry of Health
4. Workers' health and safety	- Workers wearing uniforms and PPE; - Strict compliance with the rules of SS's equipment operation and usage of PPE; - Availability of training records.	At the SS	Periodic check-ups	Periodically per specified in national norms and procedures	Avoid accidents and health impacts to SS's workers	HVEN Ministry of Territorial Administration and Infrastructure
5. Emergency preparedness	Presence of fire alarm and fire localization system, and emergency back-up systems for power supply	SS area	Periodic check-ups, including drills/simulations	Total period of operation of the facility	- Reduce risks for the staff and neighboring communities; - Avoid disruption of SS's operation.	Ministry of Territorial Administration and Infrastructure Ministry of Emergency Situations

7. DOCUMENTED PROCESS /MINUTES OF PUBLIC CONSULTATION

Introduction

The Environmental Management Plan for rehabilitation of Ararat-2 substation- both in English and Armenian languages - were published to solicit public feedback. The timeframe of March 14, 2017 to March27, 2017 was allowed for ascertaining concerns and obtaining comments/responses from concerned persons via regular mail (full address of HVEN was provided), email and corporate telephone number, which was available from 9 AM to 6 PM on business days.

Materials and Methods

The English and Armenian versions of the draft EMP were posted on the web site of HVEN(http://www.hven.am/myfiles/files/pdfs/Notifications/Draft%20EMP_Ararat-2_SS.pdfhttp://www.hven.am/myfiles/files/pdfs/Notifications/%D4%B1%D6%80%D5%A1%D6%80%D5%A1%D5%BF-2_%D4%B2%D4%BF%D5%8A.pdf).

Brief information on planned works, locations (web site address and municipality) of disclosed draft EMP document, and HVEN's contact information (including full address, email, telephone number, and contact person's name) were placed at substation's entrance/fencing to allow people to express any questions or concerns regarding the document. Hard copy of draft EMP was submitted to the Ararat Municipality.

The electronic copies of the draft EMP and HVEN's contact information were also submitted to the following non-governmental organizations:

- Ararat Aarhus Center – Mr. G. Nanyan, Head of the Center;
- Yerevan Aarhus Center – Ms. S. Ayvazyan, Head of the Center;
- Acopian Center for the Environment, American University of Armenia – Mr. A. Amirkhanian, Director;
- Transparency International Anticorruption Center, Armenia – Ms. S. Ayvazyan, Executive Director; and
- "Energy Saving Alliance" Armenian Branch – Ms. A. Pasoyan, Director.

PHOTO DOCUMENTATION

Notifications placed at Ararat-2 substation