

Yerevan 2 CC Power Plant

ArmPower CJSC - Environmental and Social Impact Assessment - Non Technical Executive Summary

PROJECT BACKGROUND AND OBJECTIVES

The Ministry of Energy (MOE) of the Republic of Armenia plans to support the construction of a new gas fired Combined Cycle Power Plant of 254 MW. The new modern and efficient Power Plant is named YCCPP-2, and will be built at the site next to the existing YCCPP-1 in the industrial area of Yerevan. With this project, the MOE aims to:

-) Improve the total output capacity of electric energy production;
-) Provide reliable power supply;
-) Shift the financial burden for power generation from the government to the private sector;
-) Promote commercial development of thermal technology and cost reduction that enables Armenia to become a major net exporter of electricity; and
-) Build and sustain local capacity in the development and maintenance of power generation infrastructure.

RENCO SPA will be the Engineering, Procurement and Construction Contractor for this Project. The operation of the power plant will be made by ArmPower CJSC, a subsidiary company of RENCO SPA.

The Project has already obtained the national environmental approval from the Ministry of Nature Protection in January 2017. However, the project developer aims to obtain financing from the International Financing Corporation (IFC) and the Asian Development Bank (ADB). Because of this, a new **Environmental and Social Impact Assessment (ESIA)** Report regarding the YCCPP-2 (“the Project”) was prepared by a German consulting company (Fichtner GmbH & Co. KG) supported by an Armenian consulting company (Consecoard LLC). The new ESIA was prepared on the basis of relevant national and international standards for environmental and social sustainability.

OBJECTIVES AND METHODOLOGY OF THE ESIA STUDY

On the basis of the existing environmental situation and the technical planning of the power plant, Fichtner determined and evaluated the environmental and social impacts during the future construction, operation, and decommissioning of the planned YCCPP-2. The impact assessment focused on the relevant aspects of the biological, physical and social environment of the Project. In a second step appropriate measures were considered to avoid, minimize, mitigate and offset any adverse impacts and to monitor their implementation.

After public disclosure of the ESIA, public consultations will be executed in order to seek feedback and concerns of stakeholders and people possibly affected by the Project.

For the ESIA, Fichtner’s team undertook several field investigations. Several specialists took samples of atmospheric air, soil, groundwater and water from the Hrazdan River. The levels of noise in the area were also evaluated. The team also talked to local authorities and non-governmental organizations to collect important information about the site and the surroundings.

LEGAL FRAMEWORK

The planned implementation of any activity in Armenia that may cause environmental impacts needs a positive conclusion of an EIA (Environmental Impact Assessment) expertise. All environmental impacts of planned physical activities or sectoral/ regional development plans/ programs have to be assessed during the EIA preparation period. The Republic of Armenia **Law on Environmental Assessment and Expertise of 2014** stipulates provisions regarding environmental impact assessment, realization and terms, thus being the most important national law for carrying out an EIA. In this law; “Thermo power plants, heat and hot water producing plants” are listed as requiring an EIA process.

The ESIA for YCCPP-2 was prepared having also in consideration international requirements of the financing agencies IFC and ADB.

PROJECT DESCRIPTION

The new Power Plant (YCCPP-2) will have as main components a gas turbine with generator (GTG), a Heat Recovery Steam Generator (HRSG), and a steam turbine with generator (STG). It will produce 254 MW of energy for at least 20 years. The construction will start in February 2018 the operation at the end of 2019.

The **Project Area** comprises the YCCPP-2 site only. This site is located at the south eastern border of Shengavit, a highly industrialized district in the southern part of Yerevan. There are no people living in the Project Area/YCCPP-2 site. The site is situated approx. 2 km southeast of Erebuni Airport, bordering Erebuni district and has many large industrial plants and factories in its vicinity. Despite their industrial character, Shengavit and Erebuni Districts are home to a high number of residents of Yerevan.





YCCPP-1

Project Area

In the proximity of YCCPP-2 site residential complexes are found. The **Project Area of Influence** thus comprises the YCCPP-2 site and adjacent residential areas, as those might be impacted e.g. by air emissions, noise, traffic, etc. during construction and operation of the new power plant.



Project Area of Influence

ANALYSIS OF ALTERNATIVES

Several project and site alternatives were analyzed, before reaching the conclusion to build the YCCPP-2 with its specific design and in the selected location.

The 'No Project' Scenario describes the situation without implementation of the Project. In this alternative, all environmental and social impacts of the Project would be avoided, but on

the other hand the main objectives of the Project would not be achieved. This would include losses of potential jobs and business opportunities.

There are several alternatives for power production, namely hydropower, solar energy, wind energy, geothermal energy, nuclear energy, and using other fuels for thermal energy (coal, oil). The option of gas and steam combined cycle power plant was chosen, due to different constraints faced by the other alternatives for power production. For example, a coal fired power plant is more pollutant than a gas fired power plant; renewable energy sources are also considered by the Government of Armenia on the context of other programs; nuclear and geothermal energy have technology and safety concerns.

The foreseen site location allows co-utilizing the existing auxiliary systems of YCCPP-1 (e.g. waste water discharge structures, fuel gas regulators, substations and devices). This allows minimizing environmental impacts and avoids costs for newly developing such a site. This was the main reason why the foreseen site was selected together with MOE as a final option.

The initial design of the new YCCPP-2 had foreseen a stack height of 35 meters. The results of the air dispersion calculation show, however, that a stack height of 66 meters (the Good Engineering Practice stack height) is more adequate because this may allow the fulfillment of the national and international air quality standards. Also a result of the ESIA process, the design of the power plant will include provisions for an eventual future installation of equipment for reduction of the emissions of NOx.

DESCRIPTION OF THE ENVIRONMENTAL AND SOCIAL CONDITIONS (BASELINE DATA)

To understand and characterize the situation of the Project Area of Influence before the Project, Fichtner undertook a so called “baseline data collection”. This means that the team did research and was on site collecting data about fauna and flora, soil, water, climate, air quality, noise, landscape, historical and cultural sites and socio-economic conditions (including health and safety). Based on this data collection, the following main conclusions were taken:

The population in the Project Area of Influence can be differentiated into urban population of the districts of Shengavit (approx. 140,000 inhabitants) and Erebuni (approx. 117,000 inhabitants); and the village population of Ayntap (approx. 11,000 inhabitants) and Kharberd (approx. 17,000 inhabitants). Sensitive receptors which might be affected by noise and air emissions during construction, operation, and decommissioning of YCCPP-2 have been identified in the vicinity of the new power plant. These are people living in the adjacent residential areas in the Project Area of Influence. There are no persons living within the YCCPP-2 site/Project Area, and no one uses the site in any way.

The site of the YCCPP-2 is part of the Yerevan industrial area. The site was in the past disturbed by industrial developments. The site itself and the surrounding land have poor vegetation: only some grass, herbs and some reed and bushes. There are no Natural Protected Areas inside or close to the site.

The Artashati Jrants Canal is located 700 m south east of the construction site. No water from the canal will be used for YCCPP-2 and no water will be discharged to it. The Hrazdan River is the closest river to the site, and the water quality is categorized as bad. The underground water level is high in the area (between 0.5 and 7.0 m).

The soil at the construction site is contaminated with oil and heavy metals. Because of this, the soil that will be excavated for construction of YCCPP-2 will have to be carefully stored. Unfortunately, at the moment there are no specialized hazardous waste landfills in Yerevan.

The levels of air pollutants in the area were measured with specialized equipment during Summer 2017 and Autumn 2017. The results show low levels of the pollutants dust (PM₁₀), sulfur dioxide (SO₂) and nitrogen dioxide (NO₂). The noise levels at some areas around the YCCPP-2 are nowadays high, due to the presence of industrial facilities and traffic.

There are no known historical or cultural sites within the Project Area. The Ministry of Culture shall be informed by RENCO about the Project prior to construction, in order to allow the Ministry to perform a proof of occurrence/absence of any cultural or historical goods at the Project site.

ENVIRONMENTAL AND SOCIAL IMPACTS AND MITIGATION MEASURES

This section describes the major environmental and social impacts expected from the construction and operation, as well as decommissioning, of the Project. The measures to reduce or eliminate these impacts are also described.

As a general and framework mitigation measure for the construction and operation stages, separate site-specific Health, Safety and Environment Management Plans (**HSEMP**) will be developed by RENCO as EPC Contractor (for construction) and by ArmPower as operator (for operation). Also two separate Health, Safety and Environment Management Systems (**HSEMS**) will be implemented during construction and during operation. An **HSE manager** of RENCO shall be on duty all the time during the construction period, and another one shall be employed for the operation period. These HSEMP and HSEMS shall also be valid for any third parties or subcontractors in the supply chain.

Detailed **Environmental and Social Management Plans (ESMPs)** have been prepared in the ESIA. They list the anticipated environmental and social impacts and provide 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. Below is the summary of some of the main mitigation/prevention measures of the ESMPs which will need to be included in the future HSEMP and HSEMS.

Environmental Impacts and Mitigation Measures for the Construction Phase

As the biodiversity value of the construction site is assessed to be low, there are only low impacts on **flora and fauna** expected during the construction phase. No **protected or sensitive areas** will be influenced by the Project.

The Project Area is not prone to soil erosion. **Soil** use is restricted to the area of the planned construction activities. Because the concentrations of heavy metals in the soil are above the national limits, the soil at the construction site has to be regarded as contaminated. Thus, the soil that will be excavated for construction of YCCPP-2 will have to be handled as hazardous waste and specially stored at the YCCPP-2 site for final disposal at a specialized hazardous waste landfill in the future. Such specialized waste landfill is not available in Armenia yet. During construction, there is a risk for more soil contamination, if there is improper waste disposal and accidental leakage from tanks of lubricants, solvents, paint, oil, diesel,

chemicals, etc. Contamination of the soil can indirectly lead to a pollution of the **groundwater**.

Possible impacts on soil and groundwater can be prevented and mitigated by a professional handling and storage of hazardous substances and a proper handling of waste. The EPC Contractor shall develop a **Waste Management Plan** for the construction period containing among others the compliance with the waste management hierarchy of avoidance, preparing for reuse, recycling as much as possible, recovery, and proper disposal of remaining waste. Hazardous waste shall be stored in adequate storage sites (lockable, roofed, ventilated, concreted and bunded floor) at the new YCCPP-2 site, clearly identified by labels, and Materials Safety Data Sheets (MSDS) shall be provided for each kind of hazardous waste. The final disposal of hazardous waste is subject to medium to long term national-level solutions to be decided upon and provided by the Government of RA.

Contamination of soil and groundwater can also be avoided e.g. by regular maintenance of all vehicles and machines at regular service stations, maintenance and re-fueling of the construction equipment only on sealed and enclosed areas, providing spill control material and training of workers regarding handling of oil, fuel, etc. and how to avoid and clean up spills. The construction site has to be equipped with toilets and sanitary rooms separately for men and women. Sewage water shall be led to the city's sewage water system or septic tanks for collecting sewage water have to be used, which have to be emptied by a specialized company from time to time.

An evaluation is currently ongoing regarding a possible **lowering of the groundwater level** for 2-3 m at the power plant's site temporarily during construction by a drainage system. If the groundwater level will be lowered, according to IFC and ADB requirements a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin needs to be done. Development of mitigation measures will be required, such as communications to third parties, providing water supply alternatives in case of need, etc

Surface water will not be influenced during the construction period.

Dust generation from transportation and construction activities, as well as emissions from vehicles and construction machinery will be the main impacts on **air quality** during the construction phase of the proposed Project. To minimize this, dust-suppressing water spray will be used during civil works whenever necessary, the trucks transporting pulverulent material will be covered, etc.

Construction of the new power plant will add further highly **visible structures** (e.g. stacks and buildings) to the Project Area of Influence. Due to the already existing industrial infrastructure in the area, the construction of YCCPP-2 will not enhance the contrast between the industrial site and the surrounding areas significantly.

Social Impacts and Mitigation Measures for the Construction Phase

During the construction period **local workforce** (mainly unskilled workers) from the nearby villages and Yerevan shall be employed for the construction works. This will contribute to much needed monetary income in the region. Special attention shall be laid on the recruitment

of women, wherever possible. However, the income generation opportunity is not of long term duration, as it will be mostly limited to the construction period.

No workers' camps will have to be established as local workers will return to their homes daily. Working personnel from abroad will be accommodated in RENCO's guesthouse or at hotels in Yerevan. Transfer to and from the construction site will be carried out by private means or public transport, and in addition by means managed by the EPC Contractor. A **Traffic Management Plan** shall be developed and implemented by the EPC Contractor.

No one lives at the YCCPP-2 site and there is no **land use** by the local population. The area has already been acquired, fenced, and is foreseen for construction of the YCCPP-2. ArmPower/RENCO has entered a land purchase agreement with the seller (Yerevan Thermal Power Plant CJSC) in March 2017. No acquisition of further land will be necessary for this Project. There are no houses located inside the construction site, so that no project-related physical relocation is foreseen.

Within the construction site and the Project Area of Influence no **cultural or historic sites** are known. For this reason, no impacts on such sites are in principle expected. However, as a preventive measure, the Ministry of Culture shall be informed by the EPC Contractor about the Project prior to construction. Afterwards, the Ministry can choose to perform a proof of occurrence/absence of any cultural or historical goods at the Project site (for example, by means of a field survey). For the case of an unexpected encounter of Cultural and Historical Sites or Goods, a **Chance Find Procedure** has to be implemented. Such procedure foresees that, in case some site or good is found, the construction has to be stopped immediately and the Agency of Protection of Historical and Cultural Monuments/ Ministry of Culture has to be informed to agree on further steps (according to Armenian Law).

The construction workers may be subject to accidents, injuries, and high levels of air pollutants and noise at the construction site, if there are no measures to prevent such situations. To avoid such impacts, the construction workers will wear Personal Protective Equipment (PPE), including: ear protection devices, if they are exposed to **noise levels** higher than 80 dB (A), according to Armenian legislation; safety shoes; helmet; safety glasses and gloves; harness when working at height; etc. All workers will receive training about health & safety at site, and will be monitored during the daily work to detect any deviations to the rules.

The impacts during construction may extend beyond impacts on workers and on the environment: they may also affect the **surrounding population**. To avoid this, several measures are foreseen. Adequate security measures to prevent accidents and injuries have to be taken when transporting construction equipment on trucks as this might be dangerous to residents, when trucks drive through residential areas or small villages (to be included in a Traffic Management Plan). The construction site itself will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access to the site, thus also minimizing possible impacts on community health & safety. Truck movements shall only be allowed during daylight, but not between 7 pm and 6 am, not to disturb the resting hours of the surrounding populations. Development and implementation of a **Security Force Management Plan**, including training and monitoring of security personnel regarding the use of force and conduct towards the community is foreseen.

The EPC Contractor shall in addition develop an **Emergency Preparedness and Response Plan** for the construction period based on robust Quantitative Risk Assessment (QRA) / Hazard Identification Study (HAZID), and assist and collaborate with the potentially affected communities and local government agencies in their preparation to respond effectively to emergency situations.

Environmental Impacts and Mitigation Measures for the Operation Phase

No **sensitive fauna or flora species** and no natural **protected areas** occur in the Project Area, so there are no impacts on these components during operation.

The **waste water** originated by the industrial process and the rain water from the new plant will be treated in a waste water treatment plant. In this treatment plant, the concentration of pollutants in the waste water will be reduced until it reaches the values to be defined by the environmental authorities for the YCCPP-2. After the treatment, the treated waste water will be led to the existing discharge system of YCCPP-1, and will then be discharged to the Hrazdan River. The waste water from the offices (domestic waste water) will be connected directly to the city's sewerage system. Rain water which is not oily will be collected for irrigation purposes inside the power plant. Thus, there will be only a low (if any) impact on aquatic organisms of Hrazdan River. A monthly monitoring program shall be established to be performed by ArmPower and the results shall be reported to the "Environmental Monitoring and Information Center" SNCO at the Ministry of Nature Protection in order to guarantee the adherence of all wastewater to the effluent standards still to be set for YCCPP-2 or international limit values, whichever are more stringent.

All **water to be used in the Plant** will be taken from the Yerevan potable water grid and will be used for all civil utilities like cooking, drinking, etc. It will also be used as process water. The necessary average monthly water quantity will be around 300,000 m³. Use of potable water is agreed and described in the Framework Agreement between ArmPower and the Government of Armenia.

Soil contamination can be possible due to spillages from oil/ fuel/ paint/ chemicals used during operation of the power plant, or due to spread of waste. Spill-control materials will be provided at the YCCPP-2, in order to clean up spills when necessary. Contamination of the soil can indirectly lead to a pollution of the **groundwater**.

Domestic **waste** produced by the plant staff shall be collected in provided bins and picked up by a contracted waste collector for disposal at Yerevan dumping site. All hazardous waste shall be stored in adequate storage sites (lockable, roofed, ventilated, concreted and banded floor) at new YCCPP-2 site for future disposal. Materials Safety Data Sheets (MSDS) shall be provided for each kind of hazardous waste. The final disposal of hazardous waste is subject to medium to long term national-level solutions to be decided upon and provided by the Government of RA. A **Waste Management Plan** shall be prepared for operation of the power plant, and shall include a risk assessment. Sizing of the storage area for hazardous waste shall be adapted to the projected volume of hazardous material and the anticipated storage duration.

An evaluation is currently ongoing regarding a possible **lowering of the groundwater level** for 2-3 m at the power plant's site permanently during operation by a drainage system. If the groundwater level will be lowered, according to IFC and ADB requirements a detailed impact assessment study including impact on the groundwater flow pattern, impact to other

groundwater users (nearby industries, agricultural use, etc.) and impact on Hrazdan river basin needs to be done.

The Power Plant will cause **air emissions** mainly of the pollutants CO (carbon monoxide) and NO₂ (nitrogen dioxide). To assess the level of impact, the ESIA presents a detailed **Air Dispersion Calculation** study made under respect of stringent international standards. As a result of this study, the plant will use the best available technologies and will build a high stack (66 meters) to make sure the air pollution impacts are kept low. A **Continuous Emissions Monitoring System** (CEMS) will be installed at the stack of the new power plant. Adherence to the limit values at the stack shall be checked continuously by ArmPower and the results shall be reported monthly to the “Environmental Monitoring and Information Center” SNCO at the Ministry of Nature Protection.

Social Impacts and Mitigation Measures for the Operation Phase

Power demand in Armenia is constantly rising due to rapidly growing economy and a rising population. Operation of YCCPP-2 with a guaranteed gross power output of 254 MW will improve the total output capacity of electric energy production and provide a more reliable power supply.

The area of the new power plant will be fenced and the entrance gates will be guarded by security staff in order to prevent any unauthorized access to YCCPP-2 site, thus also minimizing possible impacts on **community health & safety**. Security arrangements shall be guided by principles of proportionality, good international practice and Armenian law, and include training and monitoring of security personnel regarding the use of force and conduct towards the community. A **Security Force Management Plan** shall be prepared for the operation phase.

The operator shall develop an **Emergency Preparedness and Response Plan** based on robust Quantitative Risk Assessment (QRA) / Hazard Identification Study (HAZID) for the operation period, and assist and collaborate with the potentially affected communities and local government agencies in their preparation to respond effectively to emergency situations.

The new power plant will produce **noise levels** which comply with IFC/ World Bank Group standards for workers and for the public, as well as with national legislation. One **Noise Impact Study** has been prepared for the ESIA. The calculation outcomes of the noise study for YCCPP-2 have shown that the operation of the new plant will not produce any significant increase of the noise pressure at the sensitive receptors.

During operation phase the **workforce** is estimated by RENCO to be approx. 120 people comprised of administration, and operation and maintenance staff on roster working shifts. Most **jobs** at YCCPP-2 will be for skilled workers like engineers which will require specific power plant training and will not be readily found in Armenia. Graduated people (with electrical and mechanical training) from Yerevan, can potentially work at the new plant. Extensive training on the job, as well as theory training, is recommended. A few simpler jobs (e.g. food supply, housekeeping, etc.) will also be available for people which shall be employed from the adjacent residential areas (if possible).

Additional Impacts and Mitigation Measures from the new Connection Facilities

The impacts and mitigation measures mentioned in the sections above concerning the construction and operation of the Project also apply to the necessary additional connection facilities of gas, water, waste water and power. **Additional aspects** to be considered are related to eventual fell of trees, soil erosion, eventual chance finds of historical and cultural goods, and possible damages to existing gas and water infrastructures.

No additional land will have to be acquired for the construction of the planned connections. If any trees need to be felled, replanting of trees (native site-adapted tree species) shall be performed. Soil erosion shall be managed by means of an Erosion and Sediment Control Plan. The Chance Find Procedure described earlier shall also be applied in this case. If for connections works the gas or water supply has to be interrupted, all affected parties (e.g. industries, private persons) will have to be informed in advance about the date, extent and duration of the foreseen interruption.

Additional Impacts and Mitigation Measures from the Decommissioning Phase

If the power plant will be dismantled after closedown, environmental and social impacts will be mainly the same as during the construction phase. Thus, mitigation measures for the construction phase will be also valid for the dismantling works, and will have to adhere to the latest editions of national and international laws and guidelines, or even to new ones that will be relevant at the time. A Decommissioning Plan shall be prepared by the operator at least 5 years before closure of the plant, and a Detailed Decommissioning Plan shall be developed by the operator at least 18 months in advance of the closure of the plant.

A large amount of **waste** will have to be managed, if the plant will be dismantled. This will also include different types of hazardous waste. A detailed Waste Management Plan will have to be developed by ArmPower following the same principles as for the construction phase, respecting the waste management hierarchy.

Summary of Impacts

The assessment of environmental and social impacts **after implementation of the mitigation measures** is given in the following tables. The impact is classified using the following scale:

Significance of Impact:

- = high
- = medium
- = low
- = nil
- +
- ++ = locally positive
- +++ = regionally positive

Construction phase of the YCCPP-2 and associated infrastructure	
Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Use and Soil Erosion	■
Soil Contamination	■
Surface Water	○
Groundwater level lowering	■■ (still unknown)
Groundwater contamination	■

Construction phase of the YCCPP-2 and associated infrastructure	
Impact of/on	Significance of Impact on/by
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■■
Local Workforce	+
Land Use and Ownership	○
Historical and Cultural Sites	■ (if any)
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■

Operation phase of the YCCPP-2 and associated infrastructure	
Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Contamination	■
Water Courses	■
Groundwater level lowering	■■ (still unknown)
Groundwater contamination	■
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■
Electricity Supply	++
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■
Job opportunities	+

Decommissioning phase of the YCCPP-2 and associated infrastructure	
Impact of/on	Significance of Impact on/by
Fauna, Flora and Biodiversity	■
Protected Areas	○
Soil Use and Soil Erosion	■
Soil Contamination	■
Surface Water	○
Groundwater contamination	■
Climate and Air Quality	■
Landscape and Visual Aspects	■
Waste	■■
Local Workforce	+
Land Use and Ownership	○
Historical and Cultural Sites	○
Occupational Health and Safety	■
Community Health and Safety	■
Noise	■

In conclusion, from the results of the impact assessment it can be seen that the environmental and social impacts will be low or medium, if all proposed mitigation measures are

implemented. Positive impacts are related to creating of job opportunities especially during construction.

IMPLEMENTATION ARRANGEMENTS AND CAPACITY BUILDING

RENCO SPA as EPC Contractor has to implement the ESMP within its own site-specific Health, Safety and Environment Management System (HSEMS) in a proper way, and shall have an Health, Safety and Environment Manager (HSE manager) on duty throughout the construction period. This HSE officer shall prepare monthly reports of all HSE relevant incidents and accidents and send these reports to the Health, Safety and Environment Manager of ArmPower and the relevant national authorities, as well as to an external internationally experienced auditor.

The external internationally experienced auditor shall perform quarterly audits of the construction phase. The aim of the audits will be to ensure that all mitigation measures (ESMPs) are implemented adequately. In case of any discrepancies, the specialist shall implement proper actions to establish compliance with the ESMP. If this is not possible and if the discrepancy is considered to be severe, the person(s) in charge shall be empowered to stop the work immediately until compliance is achieved again. Based on his quarterly supervision and the monthly reports provided by the HSE Manager of RENCO, the external auditor will produce narrative analytical quarterly reports on environmental and social performance in the course of the Project. These reports will be furnished to ADB/, IFC and ArmPower. Additional site audits shall be performed by the external auditor during the commissioning and operation phases.

Measures for capacity building at the “Environmental Monitoring and Information Center SNCO” shall be considered. These measures should include employment of additional staff or contracting outside resources for monitoring purposes (or both). Existing staff shall be trained in effective monitoring procedures including knowledge about national and international (ADB, IFC/World Bank) guidelines and limit values.

REPORTING REQUIREMENTS

The results of the monitoring measures shall be compiled in the form of **HSE monitoring reports**. During the construction and decommissioning stages, a daily HSE log, HSE incidents and chance finds reports, internal HSE audit reports, and monthly HSE reports compiling all the previous shall be prepared. During operation, HSE incidents reports, internal HSE audit reports, and monthly HSE reports shall be prepared.

ADAPTATIVE MANAGEMENT

The monitoring of the works may reveal the necessity to adapt the mitigation and monitoring measures of the ESMPs to specific site conditions not known at the time of preparation of the ESIA.

ENVIRONMENTAL AND SOCIAL ACTION PLAN

An Environmental and Social Action Plan (ESAP) is presented in order to highlight the **most urgent steps** for implementation of the mitigation measures given in the ESMPs. This follows the requests of relevant IFC Performance Standards and ADB Safeguard Requirements, as well as other international guidelines and standards.

COMPLIANCE OF THE PROJECT WITH INTERNATIONAL REQUIREMENTS

After implementation of the mitigation measures and the ESAP, the Project complies with the requirements of all applicable IFC Performance Standards and ADB Safeguard Requirements.

INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

During the site visit in July 2017, Fichtner's environmental and social specialists performed stakeholder meetings with mayors of the adjacent villages Kharberd and Ayntap, with the Heads of Departments of Erebuni and Shengavit Administrative Districts, with the Environmental Monitoring and Information Center, with the Environmental Department of the Municipality of Yerevan, and with the NGO (Non-governmental Organization) Aarhus Center.

The mayors of Kharberd and Ayntap had no concerns regarding the implementation of the Project. As both villages suffer under a high unemployment rate (> 70%), the mayors hope that the Project will create jobs for the local population. These statements have also been supported during the discussions with the Heads of the Departments of Erebuni and Shengavit Administrative Districts.

The Draft Final ESIA is being disclosed to the public. Interested people can have access to the relevant documents, which are posted on Armpower's webpage. Armpower will also distribute printed copies of relevant documents to the local administration offices; advertisements in local media will also be made. Also the NGO Aarhus Center will receive printed copies and ensure their sharing to representative civil society organizations. According to national Armenian requirements, the disclosure period is only 7 days, but disclosure of the documents for at least two weeks is recommended.

After disclosure of the documents, one public consultation meeting on the Draft Final ESIA will be held. The consultation meeting will concentrate on interpreting the ESIA report to the stakeholders and seeking their feedback and concerns, which will then be considered in the Final ESIA report.

GRIEVANCE REDRESS MECHANISMS

In the course of the construction process, **project affected people (PAP)** may feel treated unjustly, for which case ArmPower shall maintain a viable grievance redress mechanism. The PAP are encouraged to proceed in the following way:

-) Contact the contractor's designated grievance staff in the following way: in person via designated telephone number, via email, via regular mail. Alternatively, PAPs can contact their community leader, who would convey their grievance to the contractor's designated grievance staff.
-) Lodge the complaint and provide information on the case. Each complaint will be registered and a tracking number will be assigned to it. Responses to all complaints should be provided within 15 days (or 25 days in cases where complaint resolution requires special efforts).
-) Agree with the contractor on a mitigation measure.
-) Sign if the mitigation measure has been implemented as agreed
-) Seek redress from ArmPower if not satisfied with the above mentioned procedure through designated telephone numbers, in person, or via email or regular mail. ArmPower should register all grievances and provide response within 15 days.
-) Involve appropriate NGOs.
-) Seek redress from court if all else fails.

The grievance mechanism is designed to avoid lengthy court procedures. Nevertheless, the above mentioned grievance mechanism does not limit the citizen's right to submit the case straight to the court of law just in the first stage of grievance process.

As a last resource to be utilized in case the GRM is not effective, the citizens are recommended to utilize ADB' Accountability Mechanism or IFC's Compliance Advisor Ombudsman.

Specific names and contact persons, as well as a grievances form, will be explained and distributed during the process of Public Disclosure and Consultation of the ESIA.

The EPC Contractor RENCO and the future operator of YCCPP-2 ArmPower are requested to implement an independent grievance management system to enable the workers (and their organizations, where they exist) to raise reasonable workplace concerns. This includes complaints related to non-compliance with Health & Safety matters, discrimination cases and non-consideration of equal opportunities. **The workers' grievance mechanism** shall follow the same principles as the one created for the general public: complaints must be answered in a timely and effective manner without fear of retribution; the access to the grievance mechanism shall not replace or impede the subsequent access to other redress mechanisms; the promoter will inform workers of the grievance mechanism at the time of hire and make it accessible to them.

OVERALL FINDINGS, CONCLUSION, AND RECOMMENDATIONS

The main possible impacts of the Project will be contamination of soil and water, impacts on health and safety of workers and the public, possible lowering of the groundwater level (still to be investigated) at the construction/power plant site, air and noise emissions, and liquid effluents from the new power plant.

Negative environmental and social impacts of the Project will be low or medium, if all proposed mitigation measures of the ESIA are implemented. There will be no severe social impacts from the Project; no land acquisition or project-related resettlement will be necessary. Regular **monitoring of noise and air emissions as well as effluents** during construction and /or operation phase shall be performed, in order to guarantee adherence to relevant national and/or international limit values.

Calculations of the Noise Propagation Model for YCCPP-2 have shown that the operation of **the new plant will not produce any significant increase of the noise pressure at the sensitive receptors**. The indicative cumulative impacts of the power plant on air quality may be kept below the national and international standards if a **stack height with 66 meters** is installed. RENCO will incorporate additional emission reduction measures in the design. Such measures would only be activated in case a future development in the area (a new emission source, i.e., power or industrial plant) is reasonably foreseen, or the existing pollution load is very high.

Positive impacts are related to creating job opportunities, especially during construction. The additional power generation will increase the total output of electric energy, providing a more reliable power supply.

If a lowering of the groundwater level at the construction/ plant site will be performed, a detailed impact assessment study including impact on the groundwater flow pattern, impact to other groundwater and impact on Hrazdan river basin need to be assessed including hydrogeological survey, groundwater mapping and modeling.

In summary, it can be concluded that the proposed Project of Yerevan Steam and Gas Combined Cycle Power Plant (YCCPP-2) **can be implemented without having significant adverse impacts on the ecological and social environment**, if all mitigation measures proposed in the ESIA are implemented.