
EFELER GEOTHERMAL POWER PLANT (GPP) PROJECT

Environmental and Social Assessment (ESA) Report



October 2019

ANKARA

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LIST OF ABBREVIATIONS

AIIB	Asian Infrastructure Investment Bank
BSTDB	Black Sea Trade and Development Bank
CIA	Cumulative Impact Assessment
CSR	Corporate Social Responsibility
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
ESA	Environmental and Social Assessment
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
EU	European Union
GIP	Good International Practice
GPP	Geothermal Power Plant
ILO	International Labor Organization
ISBANK	Türkiye İş Bankası
LRP	Livelihood Restoration Plan
NTS	Non-Technical Summary
OHS	Occupational Health and Safety
PAPs	Project Affected Persons
PR	Performance Requirement
RAP	Resettlement Action Plan
SEP	Stakeholder Engagement Plan
TSKB	Türkiye Sanayi ve Kalkınma Bankası

PREFACE

This Environmental and Social Assessment (ESA) Report has been prepared by 2U1K Mühendislik ve Danışmanlık A.Ş. on behalf of Gurmat Electric Generation Co. Inc. (“Gurmat” or “the Project Company”). Gurmat has realized the investment of the Efeler GPP Project.

The preparation of this Report has utilized and built upon the information contained on the regulatory permitting studies (Environmental Impact Assessment Reports and other studies) and prior bankable environmental and social instruments prepared to date for the Efeler GPP Project. Those comprise:

- an Environmental Impact Assessment (EIA) Addendum and Social Impact Assessment (SIA) Reports developed by WS Atkins International Ltd and disclosed in 2014 for the initial Efeler Geothermal Power Plants consisting of 4 units, namely Efe-1, Efe-2, Efe-3, and Efe-4 GPPs, and
- an Environmental and Social Impact Assessment (ESIA) Addendum Report developed by AECOM Turkey Danışmanlık ve Mühendislik Ltd. Şti and disclosed in October 2018 for the Efeler Geothermal Power Plant (GPP) Capacity Extension Project including Efe-6, Efe-7 and Efe-8 GPPs.

This ESA Report further builds on the findings of the ESA Scoping Report. As a result of the analysis of the Project documentation and information gathered during the site visit, no major environmental and social gaps have been identified in relation to the EBRD PRs. Still, the implementation of the mitigation and management measures should be improved as specified in the Scoping Report. Accordingly, the significance of the risks and impacts to be additionally studied and disclosed within the scope of this ESA Disclosure Pack (2019) is deemed to be moderate. The ESA Disclosure Pack (2019) includes the ESA Report, updated Environmental and Social Action Plan (ESAP) and Stakeholder Engagement Plan (SEP) as well as the Non-Technical Summary (NTS) and provides additional information to the 2014 and 2018 ESIA disclosure packs to further enhance the Project’s stakeholder engagement, environmental and social (E&S) performance and alignment with the applicable regulatory requirements and international standards.

1. INTRODUCTION

1.1 Background of the Project

The European Bank for Reconstruction and Development (the “EBRD” or the “Bank”), the Asian Infrastructure Investment Bank (“AIIB”), Türkiye İş Bankası (“İSBANK”), Türkiye Sanayi ve Kalkınma Bankası (“TSKB”) and the Black Sea Trade and Development Bank (“BSTDB”), which are referred to as the Lenders, are considering providing finance to the Efeler Geothermal Power Plant (GPP) Capacity Extension Project (the “Efeler GPP Project” or the “Project”) with an installed capacity of 97.6 MWe comprising Efe-6, Efe-7 and Efe-8 GPPs and associated infrastructure. The Project is an extension of the existing Efeler Geothermal Power Plants consisting of 4 units, namely Efe-1, Efe-2, Efe-3, and Efe-4 GPPs.

The EBRD has financed the development of the existing Efeler Geothermal Power Plants. For this initial project, a separate Environmental Impact Assessment (EIA) Addendum and Social Impact Assessment (SIA) Reports were developed in 2014 and disclosed on the EBRD’s website as well as the Project Company’s website¹. For the Efeler GPP Project, the Project Company commissioned a consultancy company in 2017 to develop supplementary environmental and social studies in addition to the national Environmental Impact Assessment (EIA) Reports prepared for Efe-6, Efe-7 and Efe-8 GPPs in order to meet the EBRD PRs and international good practice. Due to the scale and cumulative impacts of the Project, it was categorized as Category A, which requires preparation of a comprehensive Environmental and Social Impact Assessment (ESIA) disclosure package – including an Environmental and Social Management Plan (ESMP), Stakeholder Engagement Plan (SEP) and Non-Technical Summary (NTS), and review of the associated documents, followed by their public disclosure for consultation. Accordingly, an additional Environmental and Social Impact Assessment (ESIA) disclosure package was prepared and disclosed in 2018¹.

Extensive Environmental and Social Impact Assessment documentation was produced for the Project between 2012 when the National EIA Report was developed for the initial Efeler Geothermal Power Plants and this current assignment.

The National EIA Reports for Efe-6, Efe-7 and Efe-8 GPP Projects were prepared in accordance with the national regulatory requirements². The EIA Report for the Efe-8 GPP Project has been challenged at the 2nd Administrative Court of the Province of Aydın and the corresponding

¹ For 2014 and 2018 disclosure packages, please refer to <https://www.ebrd.com/work-with-us/projects/esia/efeler-gpp.html> and <http://www.mogan.com.tr/EN,89/renewable-energy.html>

² The “Regulation on Environmental Impact Assessment (dated November 25, 2014; No: 29186 and amended on June 14, 2018; No: 30451)” defines the administrative and technical procedures and principles to be followed throughout the EIA process. According to the EIA Regulation of 2014 of the Ministry of Environment and Urbanisation (MoEU), an EIA Report is compulsory for geothermal power plants with capacity above 20 MW.

environmental permit had initially been revoked, subject to the additional studies being prepared and submitted to the 2nd Administrative Court of the Province of Aydın for review. The Appeal Court (the Republic of Turkey Presidency of the Council of State 14th Division) reverted the initial revocation of the environmental permit on December 27, 2018. Nevertheless, a supplementary package of studies is being prepared to address the concerns of stakeholders and the local court decision. See Appendix – B for the court decisions.

1.2 Objectives of the Assignment

2U1K Mühendislik ve Danışmanlık A.Ş. (“2U1K” or “the Consultant”) has been engaged by the Project Company to carry out a gap analysis of the Project’s previous and current environmental and social documentation against the EBRD Performance Requirements (PRs), and upgrade the ESIA disclosure package accordingly (this “Assignment”). This will build on the previous studies and lessons learned, as well as current practices to undertake the “Assignment” and take account of the current stakeholder requirements and the courts’ decisions.

In line with the EBRD’s Environmental and Social Policy (2014), which is also adopted by the AIIB for the purpose of appraising and monitoring the Project in the scope of a co-financing between the two institutions, the objectives of this Assignment are to critically assess the existing documentation for development of the Project against the requirements of the Bank’s Environmental and Social Policy and Performance Requirements. This includes the initial phase of the Project (Efe-1, Efe-2, Efe-3, and Efe-4 GPPs), and construction/operation of the Project’s facilities and associated facilities (Efe-6, Efe-7 and Efe-8 GPPs). Accordingly, any gaps in the existing documentation and processes relative to the EBRD requirements have been clearly identified, and how the identified gap(s) could pose a risk to the Project, have been substantiated. In this way, a scope of work that would be required to fill the gaps has been identified during the Scoping Stage, which has resulted in the Environmental and Social Assessment (ESA) Scoping Report. Pursuant to the Scoping Report, necessary additional studies have been conducted and compiled in the scope of this ESA disclosure package (2019), including the ESMMP, SEP and NTS as per the proposed scope of work based on the existing publicly available information to allow appropriate disclosure. The Environmental and Social Action Plan (ESAP) has also been reviewed and updated in collaboration with the Project Company and the Lenders. This ESA Report covers the commitments agreed upon and established through the updated ESAP.

This Environmental and Social Assessment (ESA) disclosure package explicitly addresses all environmental and social risks and impacts of the Efeler GPP Capacity Extension Project together with the underlying studies, including the existing environmental and social documentation and any additional studies completed as yet, which are annexed to this ESA. Accordingly, this ESA disclosure package draws on and references the existing environmental

and social documentation and any additional studies with succinct summaries of all data available to support the impact analysis/assessment and recommendations for mitigating and management measures.

1.3 Structure of the Report

The remainder of this Report is structured as follows:

Chapter 2: Overview of the Project Status. Describes the National and International Requirements including, Environmental and Social Assessment, Management Systems, Policies, Management and Monitoring Plan, Organizational Capacity and Commitment, Supply Chain Management and Project Monitoring and Reporting.

Chapter 3: Project Description. Describes the Project Characteristics, Project Location and Project Schedule.

Chapter 4: Outlines the Project Compliance with the EBRD Requirements. This includes the Assessment and Management of Environmental and Social Impacts and Issues, Labour and Working Conditions, Resource Efficiency and Pollution Prevention and Control, Health and Safety, Land Acquisition, Involuntary Resettlement and Economic Displacement, Biodiversity Conservation and Sustainable Management of Living Natural Resources, Cultural Heritage, Information Disclosure and Stakeholder Engagement

Chapter 5: Cumulative Environmental and Social Impacts. Outlines the Spatial and Temporal Boundaries, Valued Environmental and Social Components, cumulative Impacts and the Management.

Chapter 6: Environmental and Social Action Plan. Introduces the Environmental and Social Actions, Risks, Legal Requirement, Responsible Parties, Timetable and Target and Evaluation.

2. OVERVIEW OF THE PROJECT STATUS

The construction and investment of the Efeler GPP Project have been realized by Gurmat Generation Co. Inc. (“Gurmat” or “the Project Company”), which is a sub-company of Mogan Energy Investment Holding Co. Inc., an investment holding established by Guris Holding Co. Inc. for the group’s investments in the energy sector. The organization chart for Germencik Geothermal Power Plants is presented in Appendix-C.

The Efeler GPP Project is planned in the Germencik geothermal field, which is located to the western part of the Buyuk Menderes Graben in Western Anatolia. Situated in a region of abundant geothermal activity, Germencik field is one of the two hottest geothermal systems in Turkey. Geothermal fields of Germencik include three discrete areas, namely (i) Bozkoy on the northeast; (ii) Camurlu-Kavsak on the northwest; and (iii) Germencik-Omerbeyli on the south, where the latter is the most significant in the area with 220 °C temperature (ESIA Addendum Report, 2018). A map showing the locations of the geothermal systems in the Western Anatolia, with a focus on the geothermal fields of the Menderes Graben including Germencik, is provided in Figure 2-1. Over the last three decades, several geothermal power plants have been constructed and operated in the Menderes Graben in order to harness the substantial geothermal potential of the area (ESIA Addendum Report, 2018).



Source: ESIA Addendum Report, 2018

Figure 2-1. Generalized Geologic Map of Western Turkey Showing Major Fault Zones and Locations of Geothermal System (Upper Figure) and Geothermal Fields of Menderes Graben (Lower Figure)

Residing in this major geothermal system, the Project area is located near Omerbeyli Neighborhood of Germencik District in Aydin Province. Gurmat has been operating the existing 47.4 MWe Gurmat-1 GPP since 2009 and 114.9 MWe Gurmat-2 GPP since 2014 at the Project location. Gurmat-1 GPP, also referred to as Galip Hoca GPP (please see Photo 2-1) consists of one power generating unit (double flash). Gurmat-2 GPP, on the other hand, had originally been planned as a GPP consisting of 5 power generating units, while it has then been implemented with 4 units, namely Efe-1, Efe-2, Efe-3, and Efe-4 (Efe-1 being double flash; others being binary), making a total installed capacity of 114.9 MWe (Efe-5, with a planned installed capacity of 47.4 MWe, has not been implemented). The Efeler GPP Project is an extension to the existing Gurmat-2 GPP Project. The Project comprises construction and operation of Efe-6, Efe-7 and Efe-8 GPPs. The photograph of the site for the Efe-6 GPP as one of the binary geothermal power plants operated within the scope of the Project is presented in Photo 2-2. The Project, with an installed capacity of 97.6 MWe, has aimed to increase the existing total operating capacity of Gurmat-2 GPP from 114.9 MWe to 212.5 MWe.



Photo 2-1 Galip Hoca GPP (Double Flash) Site



Photo 2-2 Efe-6 GPP (Binary) Site

Among Gurmat-1 Project, Gurmat-2 Project and the Efeler GPP Capacity Extension Project, Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4, Efe-6 and Efe-7 GPPs are in operation. For the Efe-8 GPP Project, land preparation works including ground improvement have been completed while

drilling works for the production and reinjection wells are partly completed. Construction of Efe-8 Binary Unit and piping between production wells, binary unit and reinjection wells are remaining activities of the Efe-8 GPP Project. Land acquisition process of pipelines' right-of-way is not started yet.

Even though Gurmat-1 GPP Project (also known as Galip Hoca GPP Project), and Gurmat-2 GPP Project consisting of Efe-1, Efe-2, Efe-3 and Efe-4 GPPs are not directly part of the Efeler GPP Capacity Extension Project, they have also been taken into consideration in the scope of this ESA disclosure package due to the fact that the mentioned Projects are owned and sponsored by Gurmat, and managed in an integrated manner. They also share many facilities including the associated facilities and induce cumulative impacts in the region as they are located in the same district.

2.1 Overview of the Project Status as per the National Requirements

For Gurmat-1 (Galip Hoca) and Gurmat-2 GPP Projects (Efe-1, Efe-2, Efe-3, and Efe-4), the Environmental Impact Assessment (EIA) Reports prepared under the national EIA Regulation have been approved and the Electricity Generation Licenses have been secured from the relevant authorities as necessary. In addition, the Electricity Generation Licenses for Efe-6 GPP (2017) and Efe-7 GPP (2018) and License for Efe-8 GPP (2019) have also been obtained. The EIA positive decisions required for Efe-6 and Efe-7 GPPs as part of the Efeler GPP Project have been obtained in 2016 and 2017, respectively. The approval for the EIA Report of Efe-8 GPP was initially issued in June 2017, and then cancelled as per Docket No. 2017/759 Decision No. 2018/886 of the 2nd Administrative Court of Aydın in consequence of the request of Aydın Environment and Nature Association (Aydın Çevre ve Doğa Derneği) for cancellation of the EIA Approval on July 11, 2017. Summary of the arguments put forward by Aydın Environment and Nature Association for cancellation of the EIA Approval were as follows:

- “The EIA Approval is not in compliance with:
 - The Constitution of the Republic of Turkey, Articles 17 and 56,
 - The Environmental Law No. 2872 ratified in August 1983, Articles 9 and 10,
 - The Regulation on Environmental Impact Assessment (dated November 25, 2014; No: 29186 and amended on June 14, 2018; No: 30451), Article 14,
- The Project has impacts on the olive groves and general environment (i.e. soil pollution), agricultural areas (e.g. olive groves and fig trees) and water resources (e.g. rivers) located in the relevant geographical area; and
- The administrative act of granting the EIA Approval is against the public interest and therefore, should be cancelled.”

On that account, an additional independent expert review (who will be assigned by the court) has been required to identify the potential impacts of the Efe-8 GPP on the olive groves and the determination of the distance between the Project site and olive groves as well as the evaluation of the Project's compliance with Law No. 3573 on Olive Improvement and Grafting of Wild Species (Official Gazette No. 4126, 07.02.1939).

According to the information provided by Gurmat, a revision of the EIA process on the topics mentioned in the local administrative court decision had been started with a new consultant (Cinar), and was then stopped by the Project Company after the reversal decision of the 14th Division of the Republic of Turkey Presidency of the Council of State due to the fact that there is no need for a revised EIA Report as per the subject decision. For the prospective revised EIA Report, Gurmat already has the assessment report prepared about the impacts of geothermal power generation on olive production. A hydrogeological investigation report has also been prepared accordingly. The decision of the Presidency of the Council of State dated December 27, 2018 (Docket No. 2018/5091 Decision No. 2018/8330) abolished the decision of the 2nd Administrative Court of Aydin relating to cancellation of the approval for the EIA Report and reinstated the Environmental Permit for the Efe-8 GPP Project. Furthermore, the judgment of the Presidency of the Council of State does not comprise any decisions to stop execution of the construction works until the resolution of the court case. Accordingly, the EIA Approval of the Ministry of Environment and Urbanization is effective, and therefore, Gurmat can start construction. In this respect, the dispute must be reconsidered by the 2nd Administrative Court of Aydin and a new verdict must be rendered based on the recent decision of the Presidency of the Council of State. In other words, a new process regarding "re-examination of the files with respect to the additional expert examination report" shall be started in the 2nd Administrative Court of Aydin.

The key characteristics as well as the status of the electricity generation licenses and EIA decisions for Gurmat-1, Gurmat-2, and the Project (Efe-6, Efe-7 and Efe-8) are summarized below in Table 2-1.

Table 2-1. Key Characteristics for Gurmat-1, Gurmat-2, and the Project (Efe-6, Efe-7 and Efe-8) and Status of the Electricity Generation Licenses and EIA Decisions

Name of the Project	Name of the GPP	Process Type	Project Status/Phase	Installed Capacity (MWe)	Status of the Electricity Generation Licenses	Status of the EIA Decisions
Gurmat-1	Galip Hoca	Double Flash	Operational since 2009	47.4	The license for electricity generation is available.	- The EIA positive decision is in place. - The Environmental Permit is in place. - The Operational Permit is in place.
Gurmat-1 Total				47.4		

Name of the Project	Name of the GPP	Process Type	Project Status/Phase	Installed Capacity (MWe)	Status of the Electricity Generation Licenses	Status of the EIA Decisions
Gurmat-2	Efe-1	Double Flash	Operational since 2015	47.4	The license for electricity generation is available.	- The EIA positive decision is in place. - The Environmental Permit is in place. - The Operational Permit is in place.
	Efe-2	Binary	Operational since 2014	22.5	The license for electricity generation is available.	- The EIA positive decision is in place. - The Environmental Permit is in place. - The Operational Permit is in place.
	Efe-3	Binary	Operational since 2015	22.5	The license for electricity generation is available.	- The EIA positive decision is in place. - The Environmental Permit is in place. - The Operational Permit is in place.
	Efe-4	Binary	Operational since 2015	22.5	The license for electricity generation is available.	- The EIA positive decision is in place. - The Environmental Permit is in place. - The Operational Permit is in place.
	Efe-5	Double Flash	Implementation is cancelled	-		
	Gurmat-2 Total			114.9		
Efeler GPP Capacity Extension Project	Efe-6	Binary	Operational since August 2017	22.6	The license for electricity generation is available.	- The EIA positive decision is in place. - The Environmental Permit is in place. - The Temporary Operational Permit is granted. - The Operational Permit is in place..
	Efe-7	Binary	Operational since October 2018	25.0	The license for electricity generation is available.	- The EIA positive decision is in place. - The Environmental Permit is in place. - The Operational Permit is in place.
	Efe-8	Binary	Construction works are halted due to cancellation of the approval for the	50.0	The license for electricity generation is available.	- The EIA positive decision is available³. - The Construction Permit is in place.

³ The recent decision of the Republic of Turkey Presidency of the Council of State 14th Division dated 27.12.2018 (Docket No. 2018/5091 Decision No. 2018/8330) reinstating the Environmental Permit for the Efe-8 GPP Project automatically supersedes the judgment rendered by the 2nd Administrative Court of Aydın relating to cancellation of the approval for the EIA Report. Furthermore, the judgment of the Presidency of the Council of State does not comprise any decisions to stop execution of the construction works until the resolution of the court case. In that respect, the EIA Approval of the Ministry of Environment and Urbanization is effective, and there is no need for a revised EIA Report or process as per the decision of the Council of State.

Name of the Project	Name of the GPP	Process Type	Project Status/Phase	Installed Capacity (MWe)	Status of the Electricity Generation Licenses	Status of the EIA Decisions
			environmental impact assessment report.			
Efeler GPP Capacity Extension Project Total				97.6		
Cumulative Installed Capacity (Gurmat-1, Gurmat-2 and Efeler GPP Capacity Extension Project excluding Efe-8 GPP)				209.9		

Source: ESIA Addendum Report, 2018

2.2 Overview of the Project Status as per the International Requirements

2.2.1 Environmental and Social Assessment

As elaborated in Section 1, the development of the existing Efeler Geothermal Power Plants consisting of units 1, 2, 3 and 4 namely Efe-1, Efe-2, Efe-3, and Efe-4 GPPs (also referred to as the Gurmat-2 GPP Project) has been financed by the EBRD and a separate Environmental Impact Assessment (EIA) Addendum and Social Impact Assessment (SIA) Reports were developed in 2014 for this past project and disclosed on the EBRD's website as well as the Project Company's website⁴. Within the scope of the EIA Addendum Report developed in 2014 by WS Atkins International Ltd., the Gurmat-2 GPP Project was classified as a Category A Project as defined by the Equator Principles, the EBRD's Performance Requirements, and IFC Performance Standards. In line with the EBRD's Environmental and Social Policy (2014), and its associated Performance Requirements (PRs), the extension of the existing Efeler GPP Project comprising Efe-6, Efe-7 and Efe-8 GPPs and associated infrastructure is also classified as a Category A Project due to the scale and cumulative impacts of the Project. In 2017, AECOM Turkey has been commissioned to develop an additional ESIA disclosure package for the Project, including an ESIA Addendum, a SEP and an NTS, which were disclosed in 2018⁵.

As specified in PR1, Category A projects could result in potentially significant adverse future environmental and/or social impacts which cannot readily be identified or assessed and requires the Project Company to carry out a comprehensive Environmental and Social Impact Assessment (ESIA). Accordingly, the ESIA process includes a scoping stage to identify the potential future environmental and social impacts associated with the Project. The ESIA should include an examination of technically and financially feasible alternatives to the source of such impacts, including the non-project alternative, and document the rationale for selecting the particular course of action proposed. It should also identify potential improvement opportunities

⁴ For 2014 disclosure package, please refer to <https://www.ebrd.com/work-with-us/projects/esia/efeler-gpp.html> and <http://www.mogan.com.tr/EN,89/renewable-energy.html>

⁵ For 2018 disclosure package, please refer to <https://www.ebrd.com/work-with-us/projects/esia/efeler-gpp.html> and <http://www.mogan.com.tr/EN,89/renewable-energy.html>

and recommend any measures needed to avoid, or where avoidance is not possible, minimize and mitigate adverse impacts. The assessment of environmental and social impacts should consider potential direct, indirect and cumulative impacts related to the project, as well as potential transboundary impacts, where relevant. The ESIA process should also include a public disclosure and consultation process as specified in PR 10.

In the case of the Efeler GPP Project, which is a Category A project involving existing facilities, an assessment of the environmental and social issues of past and current operations is required. The purpose of this assessment is to identify potential risks, liabilities and opportunities associated with the existing facilities and operations, to confirm the current status of regulatory compliance, to assess the Project Company's existing management systems and overall performance against the PRs and if there are any gaps in the current documents, to develop a supplementary environmental and social assessment (ESA) to address these gaps. In this regard, the EIA Addendum and SIA Reports disclosed in 2014 for the Efe-1, Efe-2, Efe-3, and Efe-4 GPPs as well as the ESIA Addendum disclosed in 2018 for the extension of the existing Efeler GPP Project have been reviewed, in particular, the below listed sections:

Project Description: Sections 1, 2 and 3 of the EIA Addendum Report (2014) and Sections 1 and 2 of the SIA Addendum Report (2014) as well as Section 1 of the ESIA Addendum Report (2018) have been updated within the scope of this Report. In particular, Sections 1, 2 and 3 of this Report present the most up-to-date information relating to the Efeler GPP Project. The status of the units of the Efeler GPP Project has been updated and revised in Section 2 as follows: Efe-1, Efe-2, Efe-3, Efe-4, Efe-6 and Efe-7 GPPs are in operation, and for the Efe-8 GPP Project, land preparation works including ground improvement have been completed while drilling works for the production and reinjection wells are partly completed. Furthermore, it has been indicated that construction of Efe-8 Binary Unit and piping between production wells, binary unit and reinjection wells are remaining activities of the Efe-8 GPP Project. Above all, cancellation of the approval for the EIA Report of the Efe-8 GPP Project by the 2nd Administrative Court of Aydin and reversion of the revocation of the corresponding environmental permit by the Appeal Court (the 14th Division of the Republic of Turkey Presidency of the Council of State) have been elaborated in Section 2.1. The supplementary package of studies being prepared to address the concerns of the stakeholders and court decision has also been specified in Section 2.1. Moreover, the contents of Section 3.1 excerpted from the ESIA Addendum Report (2018), have been updated in accordance with the most recent information.

Area of Influence: As indicated in Table 7-1 in the Scoping Report, Section 4.2 of the SIA Addendum Report (2014) and Figure 5-5 in the ESIA Addendum Report (2018) cover sufficient amount of information and hence require no updates within the scope of this Report.

Environmental Baseline including Ecology: Section 4 of the ESIA Addendum Report (2018) covers sufficient amount of information and hence requires no updates within the scope of this Report.

Social Baseline: Section 5 of the SIA Addendum Report (2014) and Sections 4.7, 4.8, 4.9, 4.10 and 4.11 of the ESIA Addendum Report (2018) cover sufficient amount of information and hence require no updates within the scope of this Report. Nevertheless, as part of this ESA Report (2019), a team of social experts analysed the public and media's perception on geothermal power plant projects located in Aydin Province, especially in Germencik and Efeler Districts on national and local news sites and social media platforms (including Instagram, Twitter, Facebook and Youtube). Details of each platform's assessment can be found in Appendix-D.

Environmental Impact Assessment including assessment of the impacts on:

- **Air quality (odour problems):** The emission calculation results (hydrocarbons, carbon monoxide, nitrous oxides, sulphur oxides and dust) for the construction phase of Efe-6, Efe-7 and Efe-8 GPPs provided in the national EIA Reports are presented in Section 4.1 on Air Emissions in the ESIA Addendum Report (2018). It is further noted in the ESIA Addendum Report (2018) that since the calculated emission values for the construction phase are below the limits stipulated in the national Industrial Air Pollution Control Regulation (IAPCR), no modelling studies are conducted within the scope of the national EIA Reports.

As also specified in Section 4.1 on Air Emissions in the ESIA Addendum Report (2018), the national EIA Report for the Efe-6 GPP identifies or assesses no impacts for the operation phase emissions; whereas the cumulative H₂S emissions to be sourced from Gurmat-1, Gurmat-2 and Efeler GPPs are assessed through modelling in the national EIA Reports for Efe-7 and Efe-8 GPPs. The results of the H₂S modelling studies provided in the national EIA Reports for Efe-7 and Efe-8 GPPs are summarized in the ESIA Addendum Report (2018). As the identified short-term values are below the limits stipulated in the IAPCR, both of the national EIA Reports for Efe-7 and Efe-8 GPPs conclude that the GPPs will not have cumulative impacts in terms of H₂S emissions. Yet, the impacts of H₂S emissions resulting from the Gurmat-1, Gurmat-2 and Efeler GPPs have further been assessed in Section 4.1 as part of this ESA Report (2019) considering the occasional complaints received from the locals due to the resultant odour problem, which is one of the major concerns for geothermal power plants.

- **Non-condensable gases:** Section 4.2 of the ESIA Addendum Report (2018) covers the assessment of the potential GHG emissions associated with exploration, construction

and operation phases of the Project. Within the scope of this Report, Section 4.2 provides further detail on the assessment of the NCGs.

- **Water quality:** Section 4.3 of the ESIA Addendum Report (2018) covers sufficient amount of information and hence requires no updates within the scope of this Report. The contents of Section 4.4 on Water Resources have been improved through the Hydrogeological Investigation Report dated February 2019, which has specifically been prepared for the Efe-8 GPP Project.
- **Noise:** Section 4.5 of the ESIA Addendum Report (2018) covers sufficient amount of information and hence requires no updates within the scope of this Report.
- **Ecology:** Section 4.4 of the ESIA Addendum Report (2018) covers sufficient amount of information and hence requires no updates within the scope of this Report.

Social Impact Assessment: Section 4.9 of the ESIA Addendum Report (2018) specifies that land acquisition process is complete and all required land was acquired on willing-selling basis, where agreements were reached with landowners in terms of a mutually agreed price. Section 4.10 of this ESA Report (2019) elaborates that land acquisition for the Project is complete except for the Project components including the production and reinjection wells, station site and pipelines. The Project area had undergone land consolidation in 2013, and the majority of land acquisition was completed after land consolidation. Land has been acquired through numerous land acquisition techniques depending on the Project component such as willing buyer seller negotiations for well and plant site, obtaining right of way for pipelines, obtaining usufructuary right for pipelines and renting. Within the scope of this ESA Report (2019), as described in Section 4.10, phone interviews were conducted with the previous owners of the parcels in order to verify the process of land acquisition and how the compensations were spent to assess livelihood impacts. All owners stated that the compensations paid by the Project were above the market prices; and compensations were received fully. In this regard, there are no outstanding grievances pertaining to land acquisition for willing buyer seller led permanent land acquisition. Payments for pipelines were also conducted by obtaining right of way, usufruct rights or tenancy agreements. All compensations were paid to the landowners. There are no grievances pertaining to land acquisition conducted by right of way, rental and usufruct rights.

Cumulative Impact Assessment: Section 5 of the ESIA Addendum Report (2018) covers sufficient amount of information and hence requires no updates. Further information can be found in detail below in Section 5 of this Report.

2.2.2 Environmental and Social Management Systems

According to PR1, the Project Company is required to establish and maintain an Environmental and Social Management Systems (ESMS) appropriate to the nature and scale of the Project and commensurate with the level of its environmental and social impacts and issues in line with good international practice (GIP). The objective of such a management system is to integrate the implementation of environmental and social requirements into a streamlined and coordinated process and to embed it in the main operational activities of the client assessment of impacts and issues.

Gurmat has Quality Management System and Environment Management System as well as Occupational Health and Safety Management System in place, which are certified to meet the requirements of ISO 9001:2015, ISO 14001:2015 and OHSAS 18001:2007 standards, respectively, for electric power generation.

The commitments specified in the ESIA Addendum Report and Stakeholder Engagement Plan, which were disclosed in October 2018 for the Efeler GPP Capacity Extension Project should be incorporated to the managements systems. In this regard, as indicated below in Section 5.1.4, an Environmental and Social Management and Monitoring Plan (ESMMP) have been developed and presented in Appendix-E for the construction and operation phases of the Efe-8 GPP Project and for the operations of the other units (Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4, Efe-6 and Efe-7) in order to present the measures for the environmental and social impacts of the Project, which are developed based upon the information gathered regarding the baseline conditions of the Project site and the impact assessments that were described in the main text of the ESIA Addendum Report (2018). Accordingly, the ESMMP identifies the need for the development and implementation of a number of management plans as part of the management systems of the Project Company for different phases of the Project. As per 2018 ESIA Disclosure package, following management plans and policies⁶ have been prepared and implemented by the Project Company;

- Emergency Response Plan
- Environmental Policy
- Environmental Management System Procedure
- Environmental Management System Manual
- Environmental Management System Implementation Guidelines
- OHS Management Program
- OHS Policy

⁶ All the items listed are being revised to meet with EBRD requirements by the Project Company.

- OHS Procedure
- Annual Training Plan
- Training Procedure
- OHS Manual
- Non-compliance Control Procedure
- Corrective and Preventive Actions Procedure
- HR Procedure
- HR Policy
- Personnel Regulation
- Procurement Procedure
- Security Management System Procedure
- Communication Procedure
- Subcontractor Management Procedure
- Hazard and Risk Assessment Procedure
- Waste Management Plan
- Stakeholder Engagement Plan

In order to comply the Project with EBRD requirements following management plans and procedures are currently being established by the Project Company as;

- Security Management Plan
- Retrenchment Plan
- Demobilization Plan
- Grievance Mechanism for Workers
- Hazardous Materials Management Plan
- OHS Management Plan
- Site Specific Traffic Management Plan
- Community Development Plan
- Chance Find Procedure

2.2.3 Environmental and Social Policy

As required by PR1, the Project Company should establish, as appropriate, an overarching policy defining the environmental and social objectives and principles that enable the project to achieve sound environmental and social performance. The policy will provide a framework for the environmental and social assessment and management process consistent with the principles of the PRs.

Gurmat has a Quality Policy, Environmental Policy and Occupational Health and Safety Policy in place.

The Quality Policy sets out the fundamental principles of Gurmat Electric's Quality Policy.

The Environmental Policy establishes that the Project Company Management, which aims to minimize the environmental impacts of all of their activities, will always act carefully and responsibly in order not to harm the environment and will always look for means to protect the natural resources in line with the principle of "Respect for Nature". In order to continuously improve their Environmental Management System and to prevent environmental pollution, Gurmat is committed to provide trainings to all of their employees continuously, and comply with the legislative and administrative regulations in force and other requirements to which it is subject.

The Occupational Health and Safety Policy lays out the principles that Gurmat is committed to fulfil. In this regard, it establishes that Gurmat should comply with the legislative and administrative regulations in force regarding occupational health and safety and the principles of the organizations of which it is a member.

On the other hand, the Quality Policy, Environmental Policy and Occupational Health and Safety Policy do not make reference to any international standards including the PRs of the EBRD, and they should refer to the PRs of the EBRD.

2.2.4 Environmental and Social Management and Monitoring Plan

According to the discussions with Gurmat Electric, it is understood that there is no Environmental and Social Management and Monitoring Plan. In this regard, an Environmental and Social Management and Monitoring Plan (ESMMP) has been developed and presented in Appendix-E for the construction and operation phases of the Project in order to present the organizational requirements, actions and monitoring programme that will be implemented by the Project Company. It addresses the identified environmental and social impacts of the Project and issues and other performance improvement measures to meet the PRs.

2.2.5 Organizational Capacity and Commitment

The personnel of the Project Company with direct responsibilities for activities relevant to the E&S are suitably qualified and trained. According to field observations made by the 2U1K experts (March, 2019), the number of personal is not enough to meet workforce. For example according to organization chart of the Project, a total of 77 employees are currently being employed. In order to meet with required organizational capacity, the current personnel number should increase to 107 in order to meet sufficient organizational capacity.

During the construction phase of the Project, issues regarding to land acquisition and permit applications were managed by Community Affairs Manager.

Administrative Manager is currently being responsible to manage all Project related issues with Project Affected Persons (PAPs), local authorities, NGOs, and other interested stakeholders. Current Administrative Manager is not familiar with the EBRD requirements on environmental and social sustainability.

To comply with EBRD requirements, Community Liaison Officer will be hired until the end of 2019 by the Project Company to engage with all affected stakeholders and record all communication tools accordingly for monitoring. Community Liaison Officer will;

- have the right expertise and familiar EBRD's requirements and guidelines,
- be someone who can deal with state, local authorities and NGO/CSO issues,
- engage with women and vulnerable groups in a culturally appropriate manner,
- have development experience to support community investment projects in coordination with the state authorities .

2.2.6 Supply Chain Management

A number of sub-companies of Guris Holding Co. serve as subsidiaries to Gurmat Electric Generation Co. Inc. which are under the same ES management system of Guris Holding Co. and the additional ES requirements of the Project will become binding for the contractors though specific contract provisions

The construction and investment of the Efeler GPP Project have been realized by Gurmat Electric Generation Co. Inc. ("Gurmat Electric" or "the Project Company"), which is a sub-company of Mogan Energy Investment Holding Co. Inc., an investment holding established by Guris Holding Co. Inc. for the group's investments in the energy sector. The organization chart for Germencik Geothermal Power Plants is presented in Appendix-C.

The interview was conducted with the procurement unit and according to this unit, all implementations related to supply chain management are carried out within the framework of the prepared plans and procedures.

There is a Supplier Evaluation Form prepared in this regard. This form only covers OHS issues.

A Procurement Procedure is in place. The Purchasing Officer and the General Manager are responsible for the implementation of this Procedure.

Supplier companies are subject to evaluation in terms of quality, price and terminating aspects and whether they meet the requirements determined by the Quality Management System.

The evaluations of the suppliers are realized twice a year (once in 6 months). Each supplier has 100 points at the time of recruitment. In the evaluation, it decreases by 2 points if a problem occurs. The suppliers below 90 points are warned and asked to take corrective actions, and if compliance is achieved, the procurement activities are continued.

In this regard, all relevant ESAP items and ES requirements shall become binding for the EPC and their primary contractors and the subcontractors should be informed/trained in order to ensure that the subcontractors have same understanding about project requirements (all management plans, procedures and project specific standards) with sponsor (Gurmat).

The requirements for labor standards in the supply chain are outlined under Section 1-1.

2.2.7 Project Monitoring and Reporting

PR 1 requires that the Project Company should monitor the environmental and social performance of the Project to determine whether the Project is being implemented in accordance with the PRs; and to learn lessons, allocate resources and identify opportunities for continuous improvement. Accordingly, monitoring should address:

- any significant environmental and social impacts and issues identified during the environmental and social assessment process,
- relevant parts of the PRs as identified during the project assessment process and subsequent monitoring as appropriate,
- actions specified in the Environmental and Social Management and Monitoring Plan (ESMMP) presented in Appendix-E or ESAP given in Section 6, where relevant,
- grievances received from workers and external stakeholders, and how they were resolved, [1] [SEP]
- any regulatory monitoring and reporting requirements,
- any monitoring/reporting required by other parties (for example, off-takers, financiers or certification bodies). [1] [SEP]

As stated in PR 1, the Project Company will ensure that adequate systems, resources and personnel are in place to carry out monitoring. The Project Company will review the results of monitoring and initiate corrective actions as necessary. In addition, the Project Company may use third parties, such as independent experts, local communities or civil society organisations, to complement or verify its own monitoring information, when needed. Where relevant authorities

or other third parties have responsibility for managing cumulative impacts and issues and associated mitigation measures, the Project Company will collaborate with the relevant authorities or other third parties in establishing and monitoring such mitigation measures.

Gurmat Electric will continue to provide regular reports to the Lenders on the environmental and social performance of the Project, including compliance with the PRs and implementation of the ESMS, ESMMP, ESAP and Stakeholder Engagement Plan where appropriate⁷. Based on the monitoring results, the Project Company will identify and reflect any necessary corrective and preventive actions in an amended ESMMP or ESAP. The Project Company will implement agreed corrective and preventive actions, and follow up on these actions to enhance its performance.

The Lenders must be promptly notified of any environmental or social incidents, accidents, official complaints or court cases relating to the Project Company or the Project, which has, or is likely to have, a significant adverse effect.

The Lenders must be promptly notified of any changes to the Project's scope, design or operation that is likely to materially change its environmental or social impacts and issues. Also, any social/OHS and environmental incidents/ court cases will be notified to the Lenders promptly. The Project Company will carry out any additional assessment and stakeholder engagement in accordance with the PRs and amend the ESMMP or ESAP in accordance with the findings, as agreed with the Lenders.

In this regard, the ESMMP established for the construction⁸ and operation phases of the Project presents the organizational requirements, actions and monitoring program that will be implemented by the Project Company in order to:

- Avoid negative impacts;
- Minimize the residual impacts to levels which are acceptable in terms of environment, health, safety (EHS) and society, in case negative impacts are unavoidable, and;
- Operate in compliance with the national legislation as well as EBRD Performance Requirements.

The ESMMP presents the measures for the environmental and social impacts of the Project, which are developed based upon the information gathered regarding the baseline conditions of the Project site and the impact assessments that were described in the main text of the ESIA Addendum Report (2018).

⁷ Gurmat has Annual Environmental and Social Monitoring Reports in place provided to the EBRD for the years of 2015, 2016 and 2017. 2018 Annual Environmental and Social Monitoring Report is currently being prepared by the Project Company.

⁸ Construction of the Efe-8 GPP continues.

3. PROJECT DESCRIPTION

3.1 Project Characteristics⁹

Within the scope of the Project;

- 22.6 MWe Efe-6 GPP has been projected to generate an annual 180.8 GWh electricity;
- 25 MWe Efe-7 GPP has been projected to generate an annual 200 GWh electricity; and
- 50 MWe Efe-8 GPP is projected to generate an annual 400 GWh electricity.

The main characteristics of the Project are summarized in Table 3-1.

Table 3-1. Main Project Characteristics

	Efe-6 GPP	Efe-7 GPP	Efe-8 GPP
Location	Alangulu Neighborhood	Mesudiye Neighborhood	Omerbeyli Neighborhood
Installed Capacity	22.6 MWe	25 MWe	50 MWe
Annual Electricity Generation	180.8 GWh	200 GWh	400 GWh
Working Hours	12 month/year; 26 days/month; 8 hours/day*	12 month/year; 25 days/month; 8 hours/day*	12 month/year; 25 days/month; 8 hours/day*
Number of Shifts	3	3	3
Number of Operation Phase Personnel	40	8	12
Secondary Fluid	Pentane	Pentane	Pentane

Source: ESIA Addendum Report, 2018

3.1.1 Project Components

Summary descriptions of main components, auxiliary components and auxiliary facilities to be utilized by the Project GPPs are provided in this section. Certain facilities/components will be newly built in the scope of the Project, while the existing infrastructure of the Gurmat-1 or Gurmat-2 GPPs will be jointly used by Efeler GPP as feasible.

Production and Reinjection Wells

Efe-6, Efe-7 and Efe-8 will be collectively using 27 production wells to tap into the reservoir for utilizing high temperature geothermal fluid for energy generation. Following energy generation at

⁹ The contents of this section have been excerpted from the ESIA Addendum Report developed by AECOM Turkey for the Efeler GPP Capacity Extension Project, and disclosed in October 2018.

the GPP sites, the spent geothermal fluids are/will be reinjected back into the reservoir via 27 reinjection wells, which avoids reservoir depletion and related impacts such as decrease in energy generation capacity and risks such as subsidence. Wellhead facilities include inhibitor dosing system, control valves, separator, equalization tank, filters, pumps, gauging equipment, automation panels, frequency control equipment, transformer and drainage systems.

Pipelines

A network of insulated above-ground pipelines (for the views of the pipelines, please see and Photo 3-1 below) is used which provides for connection of the production wells to the GPPs and following energy generation, the GPPs to reinjection wells. The pipeline routes are selected to ensure shortest and safest routes to minimize decrease in generation performance, which potentially occurs as a result of thermal loss, since the geothermal fluids are cooled in long distances. In addition, the routes design minimizes risks to local communities and wild life that may be sourced from failures or contact with hot surfaces. Insulated pipes are used also for the same purposes.

Since multiple controlled drainage and irrigation channels are located in the Project vicinity, potential impacts on water resources were also taken into account for pipeline design and construction methods consideration. The pipelines are/will be installed on pylons to be located every 10 meters.



Photo 3-1. View of the Pipelines

The pipeline routes are selected to follow cadastre roads and parcel boundaries to minimize impacts on land use. In addition, public access and wild life mobility is ensured by design, where these pipelines cross over roads or access to plots are required.

Power Plants

Geothermal fluids transported via the pipelines are/will be utilized in the GPPs for energy generation. All of the Project GPPs use/will use binary systems. Process description for the Project GPPs is provided in Section 3.1.2. The power plant components consist of the following:

- Separators,
- Evaporators,
- Turbines and generators,
- Heat exchangers, recirculation pumps and recuperates,
- Air-cooled condenser,
- Non-condensable gases (NCG) discharge system.

In addition to the main facilities, auxiliary facilities of the binary system include power plant control system, surveillance instruments, control valves and panels, air system (compressors, dryers and tanks) for control valves, wellhead facilities, the water supply system and fire-fighting system.

Switchyards

Within the scope of the Project, high voltage switchyards adjust the voltage level of the generated energy to the national grid levels prior to connection. A new switchyard has been constructed for Efe-6 and is currently in operation. Similarly, a new switchyard will not be constructed for Efe-8, whereas no switchyard is required for Efe-7. None of the Project GPPs jointly use/will use the existing switchyards of Gurmat-1 and Gurmat-2 (Efe-1, Efe-2, Efe3 and Efe-4) GPPs.

Energy Transmission Lines

Existing Gurmat-1 and Gurmat-2 GPPs connect to the national electricity grid by using 154 kV Energy Transmission Lines (ETLs) that provide connection between the GPPs and the Germencik 154 kV Main Transformer Station. The GPPs constructed/to be constructed in the scope of the Efeler GPP Project connect/will connect to the same Main Transformer Station.

ETL information for the Project GPPs is provided below:

- The grid connection of Efe-6 GPP is being provided by the existing 154 kV, 3.9 km overhead ETL of Gurmat-1 GPP.
- Efe-7 GPP connects to Germencik Transformer Centre, via a 31.5 kV, approximately 0.9 km underground cable system, instead of an overhead ETL.
- Grid connection of Efe-8 GPP will be provided by the existing 154 kV ETL of Gurmat-2.

Emergency Ponds

The Project will utilize impermeable emergency ponds to collect geothermal fluids in case of equipment failure and other emergencies such as well blow-outs or pipeline failures. The collected fluids will later be reinjected to the reservoir and no discharge will be made to receiving environments. In case of emergencies that may potentially last longer than the time it takes for these emergency ponds to reach their capacities, all generation activities will be stopped.

Information on emergency ponds to be utilized by Project GPPs is provided below:

- Efe-6 GPP will jointly use the existing 12,500 m³ capacity emergency pond of Gurmat-1 for reinjection related emergencies, which is estimated to get full in 8 hours and 18 minutes in the case of emergency only in the Efe-6 GPP site. In addition, a separate 7,500 m³ capacity emergency pond is also constructed, which is used only by Efe-6, and is estimated to get full in 5 hours at most¹⁰.
- Efe-7 GPP will use the existing 7,500 m³ capacity emergency pond, which is estimated to get full in 2 hours and 24 minutes in the case of emergency only in the Efe-7 GPP site¹¹. No additional emergency ponds will be constructed.
- For Efe-8 GPP, a 15,000 m³ (2 x 7,500 m³) capacity emergency pond is planned to be constructed. It is estimated to get full in 4 hours and 48 minutes in the case of emergency only in the Efe-8 GPP site¹². No additional emergency ponds will be constructed.

Fire Systems

The fire extinguishing systems consist of fire hydrants and sprinkler systems for transformers and pentane tanks. Within the scope of the Project, new fire extinguisher systems are designed for Efe-6 GPP, and this system will connect to the existing fire hydrant line of Gurmat-1 GPP. On

¹⁰ For the Efe-6 GPP Project, the total reinjection flow rate has been taken as 1,350 tonnes/hour and the density of the geothermal fluid has been taken as 899 kg/m³.

¹¹ For the Efe-7 GPP Project, the total reinjection flow rate has been taken as 1,650 tonnes/hour and the density of the geothermal fluid has been taken as 899 kg/m³.

¹² For the Efe-8 GPP Project, the total reinjection flow rate has been taken as 2,800 tonnes/hour and the density of the geothermal fluid has been taken as 899 kg/m³.

the other hand, fire systems for Efe-7 GPP is designed for this GPP to use the fire systems of existing Efe-2 GPP, whereas fire systems for Efe-8 are designed for this GPP to use the fire systems of existing Efe-1, Efe-3 and Efe-4 GPPs.

3.1.2 Process Description

There are five different types of geothermal power plants: binary, single flash, double flash, backpressure and dry steam. At the utility scale, conventional steam turbines (single or double flash plants) and binary plants are used to generate electricity depending on the characteristics of the geothermal resource. Dry steam technology can be used in very specific areas where geothermal reservoir produces pure hot steam and backpressure units, with their lower efficiency relative to other technologies, are normally used for a limited time as tests units or wellhead generators until a better solution can be found.

General types and uses of geothermal resources depending on the resource temperature and geographical and geological locations are presented in Table 3-2. High temperature fields are all related to volcanism whereas low temperature fields draw heat from the general heat content of the crust and from the heat flow through the crust. Another temperature subdivision has been proposed, an intermediate or medium temperature system between the two main categories. Medium temperature fields have temperatures between 150° and 200°C.

Table 3-2. General Types and Uses of Geothermal Resource

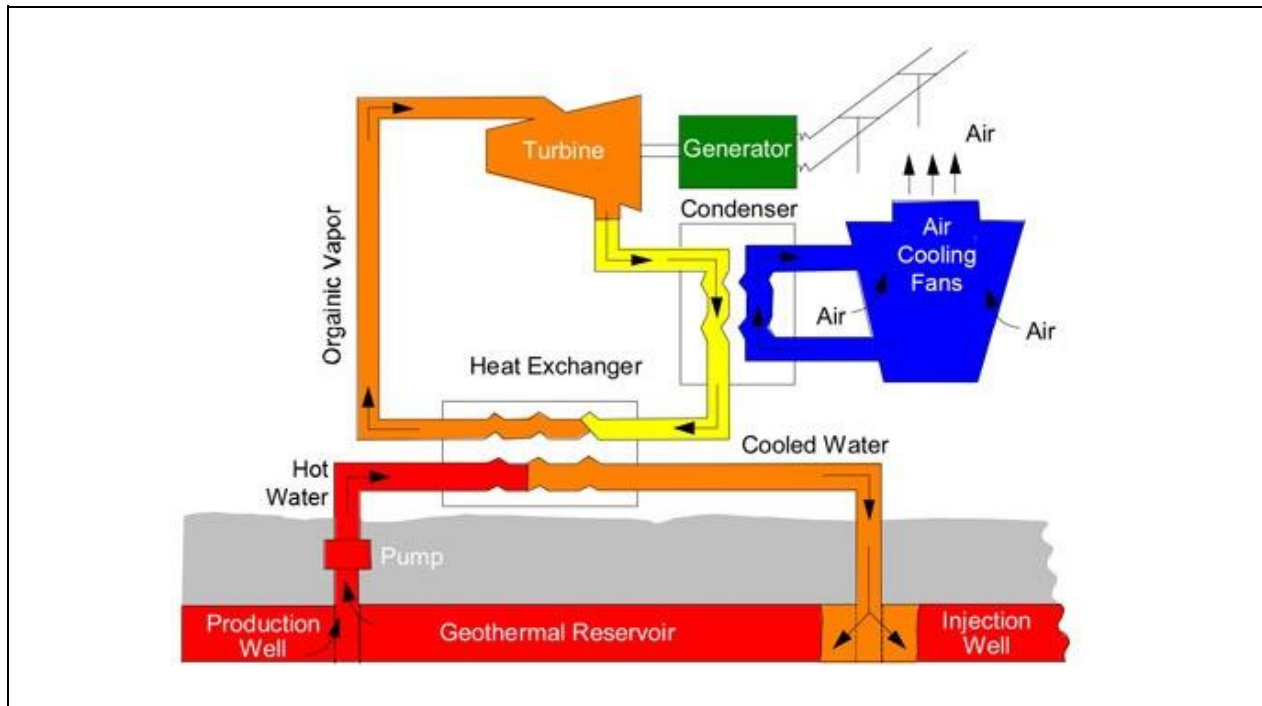
Resource Type Based on Temperature		Geographical and Geological Location	Use/Technology
High	>200°C	Globally around boundaries of tectonic plates, on hot spots and volcanic areas	Power generation with conventional steam, flash, double flash, or dry steam technology
Medium	150-200°C	Globally mainly in sedimentary geology or adjacent to high temperature resources	Power generation with binary technology
Low	<150°C	Exist in most countries (average temperature gradient of 30°C/km means that resources of about 150°C can be found at depths of about 5 km)	Direct uses (space and process heating, etc.) and, depending on location and power tariff offered, power generation with binary power plants

Source: ESIA Addendum Report, 2018

As conventional systems, single flash steam plants are usually the most economical choice for high-enthalpy liquid dominated resources. The hot water or liquid vapor mixture coming from the wellhead is directed into a separator, where the steam is separated from the liquid. The steam is expanded through a turbine and then usually reinjected, together with the separated brine, back into the reservoir. The brine could, however, be used by a bottoming unit, which utilizes the residual heat from the main power plant to generate additional power, or in another application, such as heating, cooling, or multiple use. A double flash steam cycle differs from a single flash

cycle in that the hot brine is passed through successive separators, each at a subsequently lower pressure.

In the scope of the Efeler GPP, where temperature of the resource is about 220 °C all the power generating units constructed and operated/to be constructed and operated use binary technology, which utilize a secondary working fluid, an organic fluid (n-pentane) with a low boiling point and high vapor pressure at low temperatures as compared to steam. In this process, the geothermal fluid coming from the geothermal resource (production wells) is first separated to steam and liquid phases. Afterwards, geothermal fluid is diverted to the evaporators (heat-exchanger) to convert the pre-heated secondary fluid (pentane) into steam by yielding its heat without any direct contact. Vaporized pentane is then sent to the turbines for energy generation through the generators. After turbine, Pentane in form of the gas, coming out of the turbines in the form of exhaust steam is sent to the cooling tower which is called Air Cooled Condenser (ACC) to convert from the gas pentane to liquid towards the pumps. Based on this principle and process, the closed-loop cycle repeats continuously. Moreover, the geothermal fluid, which the heat is transferred to the second fluid, is sent back to the underground to the injection wells located at different locations from production wells using high power injection pumps.



Source: ESIA Addendum Report, 2018

Figure 3-1. Typical Binary Power Plant Process

3.1.3 Chemicals Use

The main chemicals use in binary systems is the secondary fluid used for generation of electricity. This fluid, namely pentane, is supplied from international sources and delivered on-site in special containers by means of trucks or trailers under special security measures. Pentane storage is not conducted on site and pentane is directly fed to the system, which is a closed loop system where pentane is continuously recirculated. Only emergency storages for collection of pentane gas are/will be available. Other main hazardous material required for Project activities are inhibitors that are used to prevent carbonate and sulphate accumulating and creating a crust on inner walls of pipes, which if allowed may lead to leakages and failures in addition to decreased generation efficiency. The remaining hazardous materials use is mainly associated with maintenance.

According to the BEKRA declarations provided by the Project Company, Biocide and Microbiocide, Sodium Hypochlorite, inhibitor, Pentane, Isopentane, Metilbuton, turbine oil and gear oil are used by Gurmat-1 and Gurmat-2 GPPs. The amounts of chemicals are reported to the Ministry of Environment and Urbanization through the System for Reducing Major Industrial Accident Risks (i.e. BEKRA declarations).

No additional hazardous materials will be required during the operation phase of Efe-8 GPP.

3.2 Project Location

The Efeler GPP Projects are located in Germencik District of Aydin Province. The map provided below in Figure 3-2 shows the locations of the Efeler GPP Projects in addition to the existing Gurmat-1 and Gurmat-2 GPP Projects.

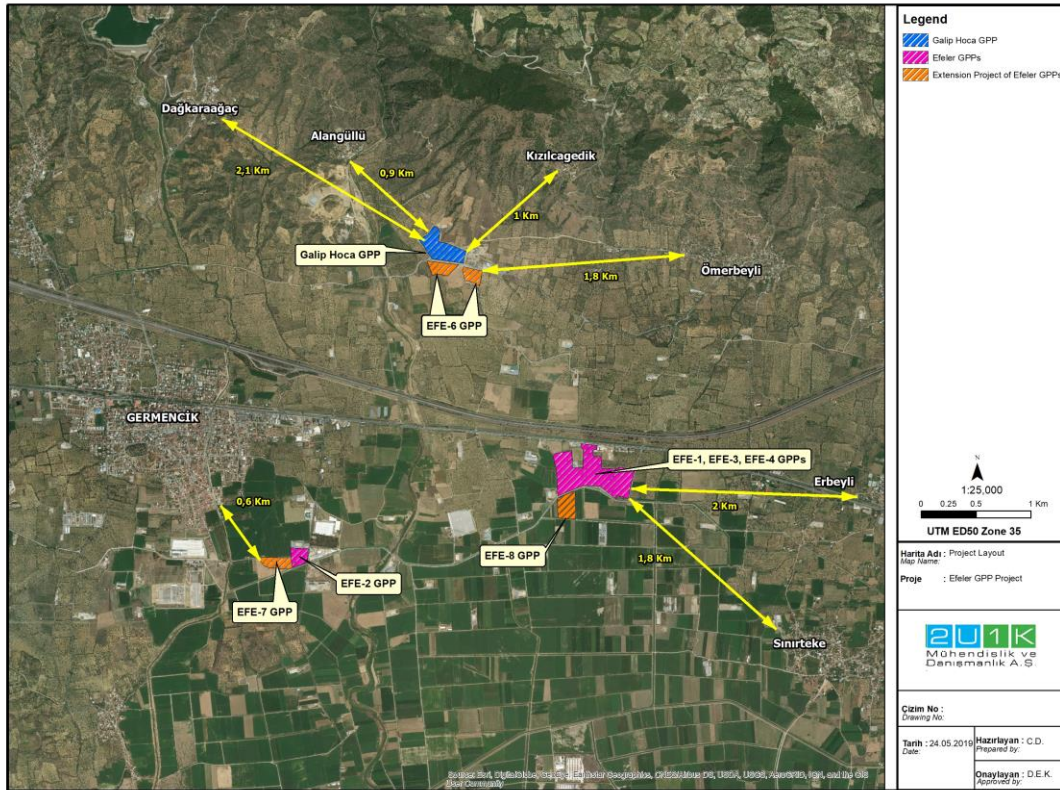


Figure 3-2 Map of the Locations of the Efeler GPP Projects in addition to the Existing Gurmat-1 and Gurmat-2 GPP Projects

The distances of the affected settlements to the Efe-6, Efe-7 and Efe-8 GPP sites are provided in Table 3-3 below.

Table 3-3 Distances of the Affected Settlements to the Project Site

Settlement	District	Distance to Efe – 6 GPP	Distance to Efe – 7 GPP	Distance to Efe – 8 GPP
Ömerbeyli Neighbourhood	Germencik	2.3 km	5 km	2.5 km
Kızılcagedik Neighbourhood	Germencik	1.9 km	4.5 km	3 km
Alangüllü Neighbourhood	Germencik	1.5 km	3.8 km	3.7 km
Turanlar Neighbourhood	Germencik	5.5 km	2.9 km	3.9 km
Sınırtete Neighbourhood	İncirliova	5 km	5.5 km	3 km
Erbeyli Neighbourhood	İncirliova	4.2 km	5.8 km	3 km
Akcesme Neighbourhood	İncirliova	3.6 km	6.3 km	3.8 km

Source: ESIA Addendum Report, 2018

3.3 Project Schedule

The revised Project Schedule is provided in Appendix-F. Accordingly, the construction works for the Efe-8 GPP are expected to continue as of June 2019 and anticipated to be completed as of June 2020.

4. COMPLIANCE WITH THE EBRD PERFORMANCE REQUIREMENTS

4.1 Resource Efficiency and Pollution Prevention

Current Status of Compliance with the Related PRs and GIIP

In this section of the Report, opportunities and alternatives for resource efficiency relating to the Project have been analysed in the light of the information received from the Project Company.

In accordance with the requirements put forth on resource efficiency as part of PR3, the environmental and social assessment process should identify opportunities and alternatives for resource efficiency relating to the Project in accordance with GIIP. In doing so, the Project Company shall adopt technically and financially feasible and cost effective measures for minimising its consumption and improving efficiency in its use of energy, water and other resources and material inputs as well as for recovering and re-utilising waste materials in implementing the Project. The key focus should be on activities that are considered the Project's core functions, but similar opportunities in the Project Company's other business activities that are not part of the Project will also be considered. The Project Company should integrate resource efficiency measures and the principles of cleaner production into product design and production processes with the objective of conserving raw materials, energy and water and, at the same time, reducing release of pollutants into the environment.

In this respect, the 2018 disclosure package addresses resource efficiency in Section 2.2 – GPP Technology, in particular. First and foremost, all GPPs within the scope of the Efeler GPP Project utilize/will utilize¹³ binary process based on exploration phase studies, existing data of the previously operational GPPs and further feasibility studies considering the estimated enthalpy, chemical characteristics and capacity of the resource. Bearing in mind that binary system allows for generation with fluid temperatures considerably lower than temperatures required for flash systems, the Project Company has adopted the technically and financially most feasible alternative for energy generation.

It is further elaborated in the ESIA Addendum Report (2018) that all GPPs within the scope of the Project (Efe-6, Efe-7 and Efe-8 GPPs) utilize/will utilize a reinjection system, where the reject fluids are reinjected back into the reservoir, with no waste fluid discharge to the receiving environments except the NCG emissions discharged to air. Therefore, impacts on soil, surface water and groundwater environments are avoided completely. Moreover, all GPPs within the

¹³ Efe-8 GPP Project is still in the construction phase.

scope of the Project utilize/will utilize¹⁴ air-cooled condenser systems, whereas a water-cooled system will only be used for cooling of turbines and generators. Hereby, the Project Company minimizes its consumption of water for the GPPs in operation. In addition, the domestic wastewater treated through the domestic wastewater treatment plants within the sites of the operating GPPs is used rather than any other water resource for irrigation of the plantings within the sites for the GPPs (for details, please refer to Section 4.4).

Gaps with the PRs and GIIP

As noted in the ESIA Addendum Report (2018), one of the key factors for selecting and designing components (turbines, condensers, gas removal systems, hydrogen sulfide abatement systems, etc.) for GPPs is non-condensable gases (NCG) content: in dry and flash steam cycles, the plant condenser separates the NCGs from the steam coming from the turbines. The nontoxic NCGs are either discharged to the atmosphere or removed by an abatement system. For binary systems, which have been utilized for the Efeler GPP Project, NCGs can be re-injected back into the reservoir with the spent fluids in a closed loop system, resulting in practically zero emissions. However, if the reservoir contains high NCG values, a closed loop is not applicable. Since the Germencik Geothermal Resource utilized/to be utilized by the Project, has a significantly high percentage of NCG content, reinjection of the NCGs is not possible, and a closed loop system to prevent emissions of the NCGs is not used by any of the Efeler GPP Project units (ESIA Addendum Report, 2018). On the other hand, Gürmat Electric conducts studies of various methods of CO₂ capture including full reinjection to make “zero-emission” possible.

Recommendations

The outputs of the EBRD’s ongoing project implemented in collaboration with the Ministry of Environment on “Development of Cumulative Impact Assessment of Geothermal Resources” in the region including the Province of Aydin will be utilized for identification of opportunities and alternatives for resource efficiency relating to the Project.

4.2 Air Emissions

Current Status of Compliance with the Related PRs and GIIP

The ESIA Addendum Report (2018) states that since the calculated emission values of hydrocarbons, carbon monoxide, nitrous oxides, sulphur oxides and dust for the construction phase of Efe-6, Efe-7 and Efe-8 GPPs provided in the national EIA Reports were below the limits stipulated in the national Industrial Air Pollution Control Regulation (IAPCR), no modeling

¹⁴ Efe-8 GPP Project is still in the construction phase.

studies had been conducted for the construction phase within the scope of the national EIA Reports. As also specified in Section 4.1 on Air Emissions in the ESIA Addendum Report (2018), the national EIA Report for the Efe-6 GPP identified or assessed no impacts for the operation phase emissions; whereas the cumulative H₂S emissions to be generated from Gürmat-1, Gürmat-2 and Efeler GPPs were assessed through modeling in the national EIA Reports for Efe-7 and Efe-8 GPPs. The results of the H₂S modeling studies provided in the national EIA Reports for Efe-7 and Efe-8 GPPs are summarized in the ESIA Addendum Report (2018). Since the identified short-term values were below the limits stipulated in the IAPCR, both of the National EIA Reports for Efe-7 and Efe-8 GPPs concluded that the GPPs would not have cumulative impacts in terms of H₂S emissions.

According to the information received from the Project Company, the monitoring stations for H₂S emissions have been set up and continue to be maintained at 15 locations in or near the Neighbourhoods of Alangullu, Kizilcagedik, Omerbeyli and the District of Germencik around the Gürmat-1 GPP (Galip Hoca) and Gürmat-2 GPPs (Efe-1, Efe-2, Efe-3, and Efe-4 GPPs). Passive diffusion method is used to determine the concentration levels of H₂S. The measurements are performed in a measurement period of 28-30 days according to the IAPCR. The measurement points were determined during the baseline monitoring studies performed in 2005, before construction of the Galip Hoca GPP was started. In the scope of this study, the measurements are made at the same points, which are shown on the map given in Figure 4-1. The measurement results of H₂S for just over a one-year period (from July 2017 until July 2018) are presented below in Table 4-1 and range between 0.01 - 1.7 µg/m³. As compared with the Turkish short-term limit value of 20 µg/m³ defined in the IAPCR and the related ambient air quality guideline value of WHO (24-hour limit value), the results are in compliance with the national and international standards at each measurement period for all points, and therefore, the ambient concentrations of H₂S do not present any threats to the health of the local communities. The measurement results even comply with the 30-min average ambient air H₂S concentration of 7 µg/m³ recommended by WHO to avoid odor annoyance.

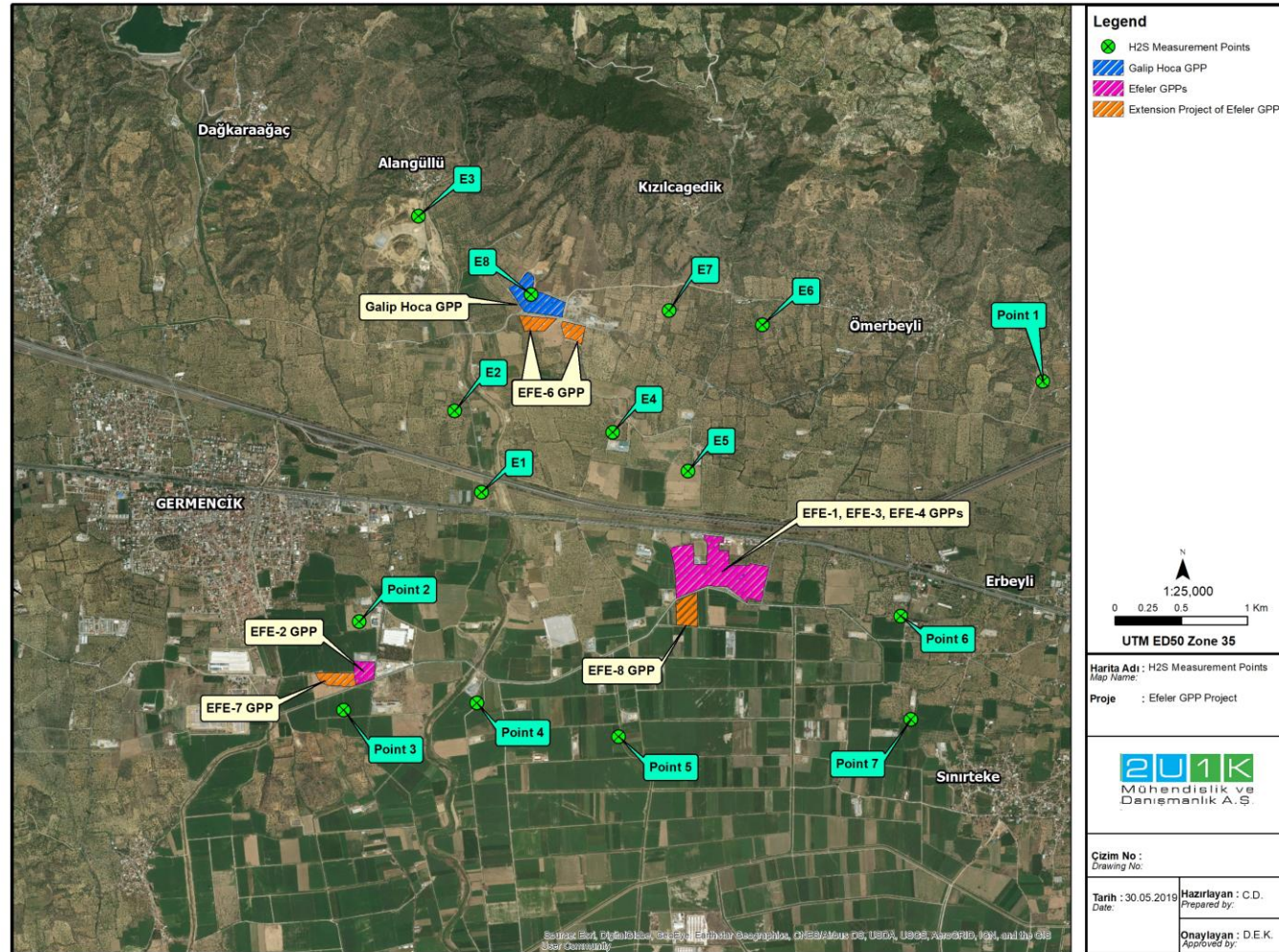


Figure 4-1 H₂S Measurement Points

Table 4-1 Monthly Measurement Results of H₂S in µg/m³ at 15 Measurement Points

Measurement Point	Coordinates	6 th Period (30.06.2017 - 01.08.2017)	7 th Period (01.08.2017 - 29.08.2017)	8 th Period (29.08.2017 - 02.10.2017)	9 th Period (02.10.2017 - 01.11.2017)	10 th Period (01.11.2017 - 01.12.2017)	11 th Period (01.12.2017 - 02.01.2018)	12 th Period (02.01.2018 - 02.02.2018)	Limit Values defined in the National Industrial Air Pollution Control Regulation (IAPCR)	WHO Ambient Air Quality Guideline Value (To avoid odour annoyance, a 30-min average ambient air concentration not exceeding 7 µg/m ³ is recommended)*
E1	555097 - 4191970	1.06	1.53	1.26	0.26	0.60	0.53	0.35	100 µg/m ³ (1-hour limit value); 20 µg/m ³ (short-term limit value)	150 µg/m ³ (24-hour limit value)*
E2	554893 - 4192581	1.05	1.56	1.32	0.09	0.70	0.47	0.33		
E3	554621 - 4194048	1.08	1.53	1.32	0.28	0.59	0.43	0.36		
E4	556087 - 4192420	1.05	1.52	1.24	0.30	1.02	0.28	0.22		
E5	556654 - 4192127	1.05	1.57	1.44	0.38	0.68	0.31	0.17		
E6	557217-4193228	1.06	1.54	1.48	0.57	0.69	0.78	0.31		
E7	556514 - 4193338	1.37	1.59	1.47	0.33	0.78	0.74	0.22		
E8	555471 - 4193457	1.41	1.60	1.39	0.67	0.98	0.72	0.21		
1 st Point	559334 - 4192805	0.94	1.64	1.22	0.23	0.18	0.37	0.17		
2 nd Point	554174 - 4190994	1.08	1.50	1.32	0.23	0.33	0.19	0.11		
3 rd Point	554054 - 4190328	1.09	1.57	1.24	0.16	0.19	0.53	0.15		
4 th Point	555061 - 4190380	1.10	1.53	1.33	0.20	0.65	0.23	0.16		
5 th Point	556131 - 4190128	1.08	1.49	1.24	0.18	0.71	0.28	0.31		
6 th Point	558261 - 4191037	1.11	1.54	1.30	0.27	0.75	0.28	0.41		
7 th Point	558337 - 4190258	1.05	1.82	1.23	0.31	0.52	0.59	0.30		

Measurement Point	Coordinates	13 th Period (02.01.2018 - 01.03.2018)	14 th Period (02.01.2018 - 01.03.2018)	15 th Period (01.03.2018 - 03.04.2018)	16 th Period (03.04.2018 - 03.05.2018)	17 th Period (03.05.2018 - 03.06.2018)	18 th Period (03.06.2018 - 03.07.2018)		Limit Values defined in the National Industrial Air Pollution Control Regulation (IAPCR)	WHO Ambient Air Quality Guideline Value (To avoid odour annoyance, a 30-min average ambient air concentration not exceeding 7 µg/m ³ is recommended)*
E1	555097 - 4191970		0.01	0.01	0.01	<0.04	0.04			
E2	554893 - 4192581		0.02	0.02	0.04	<0.04	0.05			
E3	554621 - 4194048		0.32	0.32	0.02	0.10	0.05			
E4	556087 - 4192420		0.29	0.29	0.04	<0.04	0.05			
E5	556654 - 4192127		0.30	0.30	0.03	<0.04	0.05			
E6	557217 - 4193228		0.02	0.02	0.08	<0.04	0.09			
E7	556514 - 4193338		0.03	0.03	0.06	0.06	0.08			
E8	555471 - 4193457		0.05	0.05	0.09	<0.04	0.18			
1 st Point	559334 - 4192805		0.02	0.02	0.08	<0.04	0.03			
2 nd Point	554174 - 4190994		0.01	0.01	0.01	<0.04	0.02			
3 rd Point	554054 - 4190328		0.01	0.01	0.02	<0.04	0.04			
4 th Point	555061 - 4190380		0.02	0.02	0.02	<0.04	0.04			
5 th Point	556131 - 4190128		0.02	0.02	0.01	<0.04	0.05			
6 th Point	558261 - 4191037		0.01	0.01	0.00	<0.04	0.01			
7 th Point	558337 - 4190258		0.06	0.06	0.03	<0.04	0.09			
									100 µg/m ³ (1-hour limit value); 20 µg/m ³ (short-term limit value)	150 µg/m ³ (24-hour limit value)*

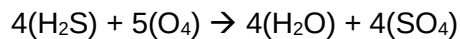
* Source: <https://www.who.int/ipcs/publications/cicad/en/cicad53.pdf?ua=1>

Gaps with the PRs and GIIP

Despite the fact that the measurement results of H₂S at 15 measurement points from July 2017 until July 2018 are well below the national and international limit values and therefore, the ambient concentrations of H₂S do not present any threats to the health of the local communities, the Project Company received many concerns and complaints from the local communities relating to the resultant odor problem due to the H₂S emissions.

Recommendations to Close these Gaps

Gurmat Electric is putting efforts in addressing the concerns and complaints of the local communities relating to the resultant odor problem due to the H₂S emissions from the Gurmat-1, Gurmat-2 and Efeler GPPs. In this regard, wet scrubbers will be installed at the outlets of the power plants in order to minimize the H₂S emissions. As a scrubber type, spray tower will be utilized. In spray towers, PROFOKS oxygen generator system extracts the oxygen from the air while holding the nitrogen making up 78 percent of the air. The extracted oxygen with 95% to 99.9% purity is converted to tetraoxygen (O₄) through PROFOKS oxygen generator modules. With the help of the disc membrane diffusers at the bottom of the spray tower, fine bubbles of tetraoxygen (O₄) are formed. The raw gas flow from the outlet of the power plant enters at the bottom of the tower and flows upward while being mixed with tetraoxygen (O₄). The raw gas and tetraoxygen flow pass into a chamber where they contact the water sprayed downward from the spiral spray nozzles directed counter to the gas flow. The nozzles are mounted on an array at the tower center. The H₂S molecules in the raw gas undergo the following chemical reaction with tetraoxygen (O₄), and sulphate salt is generated, which is dissolved in water:



Water droplets capture particles suspended in the gas flow through impaction, interception and diffusion. Droplets large enough to settle by gravity collect at the bottom of the chamber. Droplets that remain entrained in the gas stream are collected on a mist eliminator upstream of the nozzles (U.S. Environmental Protection Agency, 2002).

The H₂S removal efficiencies of the spray towers will be determined as per the conditions on-site.

4.3 Non-Condensable Gases (NCGs)

Background

In the context of geothermal power production, the geothermal gases are commonly referred to as non-condensable gases (NCGs) as they do not condense at the same physical conditions as water vapor but remain in the gas phase. The dominant NCG in geothermal fluids is carbon dioxide (CO₂), typically constituting more than 95 percent of the total NCG content. The other relevant NCG in geothermal fluids is methane (CH₄), whose concentration is generally a few hundredths to a few tenths of a percent by mass, but can in rare cases make up more than 1.5 percent of the total gas (i.e., amounting to more than 30 percent of the GHG emissions as CH₄ traps thermal radiation more efficiently than CO₂). However, the vast majority of available data on NCG emissions from geothermal power plants refers only to CO₂ (The International Bank for Reconstruction and Development, 2016).

NCGs are naturally present in all geothermal fluids, and thus geothermal power production from intermediate to high temperature geothermal resources, generally leads to some NCG release into the atmosphere. A large fraction of the CO₂ in geothermal fluids may be derived from the host rock of the geothermal system. Carbonate rocks, which have carbonate as a major constituent, may release larger quantities of CO₂ into the geothermal fluids upon dissolution or through metamorphic processes at high temperatures. Carbonate-hosted high temperature geothermal systems are not common but they do occur in a number of regions in the world including the western Turkey and are characterized by significantly higher CO₂ concentrations than other geothermal reservoirs (The International Bank for Reconstruction and Development, 2016).

As provided in the Energy Sector Management Assistance Programme's (ESMAP) Report on Greenhouse Gases from Geothermal Power Production (2016), the global average of the operational GHG emissions from geothermal power production was estimated as 122 g CO₂/kWh for the year of 2001, based on a survey involving emissions from power plants that constitute more than 50 percent of the geothermal capacity installed worldwide. In a few exceptional cases, the emission from geothermal power plants can be significantly higher than the averages, even above the values of thermal fossil-fueled power plants (which can reach 1,030 g CO₂/kWh for a subcritical circulating fluidized bed coal-fueled power plant and 580 g CO₂/kWh for an open cycle gas-fueled power plant). The highest reported GHG emission values, 900 to 1,300 g CO₂/kWh are from the power plants located in the Menderes and Gediz Grabens in the western Turkey (The International Bank for Reconstruction and Development, 2016).

The geothermal resources utilized/to be utilized by the Project are located in the Germencik Field of the northern Menderes Graben. Therefore, the field reflects the high CO₂ conditions expected in the reservoirs located in the high carbonate rocks of Menderes Graben. According to “the Numerical Reservoir Simulation of Germencik Geothermal Resource” prepared by Veizades & Associates Inc. (Veizades), Geologica Geothermal Group Inc. (Geologica) and Leidos Inc. (Leidos), the Germencik Geothermal Field is producing from Paleozoic-aged Menderes metamorphic rocks, and is a liquid-dominated mid-enthalpy geothermal system with a relatively high concentration of CO₂ in the reservoir fluid (ESIA Addendum Report, 2018).

Current Status of Compliance with the Related PRs and GIIP

NCGs have a negative effect on the efficiency of the energy conversion process and therefore need to be removed from the system (The International Bank for Reconstruction and Development, 2016). First and foremost, all GPPs within the scope of the Efeler GPP Project (Efe-6, Efe-7 and Efe-8 GPPs) utilize/will utilize¹⁵ binary process, which allows full reinjection and thereby makes “zero-emission” possible as indicated in the ESMAP’s Technical Report (2016).

All GPPs within the scope of the Project utilize/will utilize a reinjection system, where the reject fluids are re-injected back into the reservoir. In a closed loop system, NCGs can be re-injected back into the reservoir with the spent fluids, resulting in practically zero emissions. However, if the reservoir contains high NCG values, a closed loop is not applicable. Since the Germencik Geothermal Resource utilized/to be utilized by the Project, has a significantly high percentage of NCG content, reinjection of the NCGs is not possible, and a closed loop system to prevent emissions of the NCGs is not used by any of the Efeler GPP Project units (ESIA Addendum Report, 2018).

In binary plants, the fluid pressure needs to be kept high enough to prevent the formation of a gas phase throughout the process from extraction of the fluid, through the heat exchange process and, eventually, reinjection. This poses a challenge for production from gas-rich geothermal fluids, since the higher gas content in the fluid requires higher pressure to be maintained throughout the system in order to prevent phase separation. Consequently, if emission of gas from gas-rich fluids is to be prevented in pumped binary plants, the pumping may consume a considerable fraction of the power generated (The International Bank for Reconstruction and Development, 2016). In this regard, as the geothermal fluid passes through the heat exchanger, the water vapour condenses, and is re-injected back into the reservoir and the NCGs are vented out of the heat exchanger to prevent pressure build-up (ESIA Addendum Report, 2018).

¹⁵ Efe-8 GPP Project is still in the construction phase.

Within the scope of this ESA Report (2019), it has been examined whether the Project Company conducts measurements of the greenhouse gas (GHG) emissions at wells. In this regard, Gürmat Electric has provided the non-condensable gases (NCGs) analysis, which was performed in January 2017 and March 2018 at the Galip Hoca GPP, Efe-1 GPP, Efe-2 GPP, Efe-3 GPP, Efe-4 GPP, Efe-6 GPP and Efe-7 GPP locations by the accredited laboratories. Through use of the NCG ratios, which have been measured by a chemist on a regular basis, the emission rates of CO₂ are calculated and monitored for January 2017, March 2018 and March 2019. The calculated percentages of the NCG contents within the geothermal fluid, calculated percentages of the CO₂ contents in NCG and the calculated amounts of the CO₂ emissions from the Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs are presented in Table 4-2. As demonstrated in Figure 4-2, the amounts of the CO₂ emissions from the Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs show decreasing trends with the passing of time.

Table 4-2. Amounts of CO₂ Emissions from the Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4, Efe-6 and Efe-7 GPPs as of January 2017, March 2018 and March 2019

Name of the GPP	January 2017		March 2018		March 2019	
	CO ₂ Emissions (tonnes per hour)	CO ₂ Emissions (g/kWh)	CO ₂ Emissions (tonnes per hour)	CO ₂ Emissions (g/kWh)	CO ₂ Emissions (tonnes per hour)	CO ₂ Emissions (g/kWh)
Galip Hoca	31.48	678.0	31.49	678.2	29.14	611.2
Efe-1	27.83	602.1	27.00	584.1	21.57	434.5
Efe-2	23.51	902.3	19.05	731.2	11.02	419.9
Efe-3	10.70	414.5	10.09	390.8	6.89	260.9
Efe-4	19.79	781.6	18.18	718.2	19.01	720.3
Efe-6	-	-	19.46	733.3	15.91	608.8
Efe-7	-	-	-	-	12.87	466.4
Total	113.32	-	125.28	-	116.42	-
Average	-	667.1	-	637.9	-	505.9
CO ₂ kg/kWh	0.667		0.638		0.506	

Source: Gürmat Electric

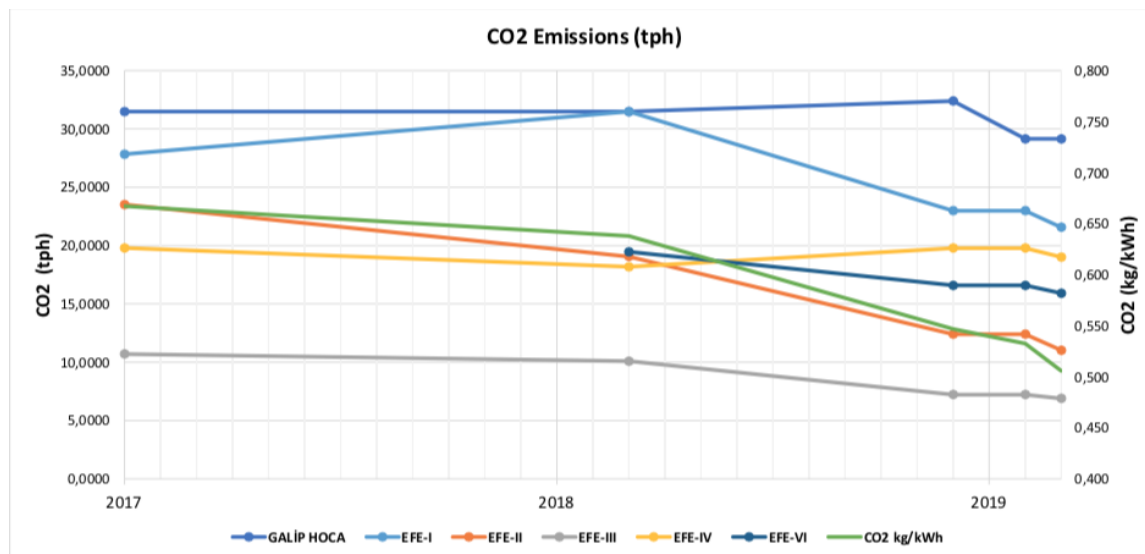


Figure 4-2 Change in the Amount of CO₂ Emissions from the Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs with the Passing of Time

Source: Gurmat Electric

The ESMAP's Technical Report (2016) points to the anecdotal evidence of a gradual decrease in CO₂ emissions from geothermal power plants over time. This effect has been attributed to the return of gas-free reinjection fluid to the reservoir, which dilutes the concentration of dissolved gases in the reservoir fluid and gradual degassing of the reservoir liquid due to progressive boiling. The ESMAP's Technical Report (2016) also states that publicly available data illustrating this process are scarce and of varying quality. Furthermore, it is impossible to ascertain whether the available data are representative for geothermal systems in general or if they are selected for publication because they show this specific effect. The magnitude of this effect in existing geothermal power plants, thus, is poorly known and the existing body of data does not allow prediction of future trends for new developments (The International Bank for Reconstruction and Development, 2016).

With the purpose of investigation of the potential for expansion of the power generating capacity at Germencik Geothermal License Area, the Numerical Reservoir Simulation Study of Germencik Geothermal Resource was conducted in May 2017 by Veizades, Geologica and Leidos, as mentioned above, for the period of 19.75 years starting with the end of January 2017 until 2035 year-end. The modeling study was conducted for 4 different production and reinjection scenarios, variants being the production and reinjection well configurations and timing of production/reinjection for the Gurmat-2 and the Project GPPs. Of these scenarios, only Scenario D considers operation of all Project GPPs (Efe-6, Efe-7 and Efe-8); which reflects the actual case. For the mentioned scenario, the forecasted CO₂ evolution with time is summarized in Table 4-3 given below. The modeling results and the assessment concluded that the CO₂

emission values for the Project decline significantly (from approximately 40% up to approximately 75%) over time, resulting in a decrease of CO₂/MWh and ensuing total annual CO₂ emissions for the Project. This decrease is attributed to the depletion of CO₂ in the reinjected fluid, as well as influx of fluid without CO₂ from the lateral boundaries. The monitoring studies discussed above also verify these modeling studies.

Table 4-3. Forecasted CO₂ Emission Values for Gurmat-1, Gurmat-2 and Capacity Extension Project Production Wells

Year	Unit	Gurmat-1	Gurmat-2				Capacity Extension Project		
			Efe-1	Efe-2	Efe-3	Efe-4	Efe-6	Efe-7	Efe-8
2020	t/h ^a	31.49	27.00	19.05	10.09	18.18	19.46	13.90	23.17
	t/year ^b	255,514	233,442	163,486	87,942	158,553	169,573	111,200	185,360
2025	t/h ^c	12.2	17.08	9.07	7.80	14.52	14.52	11.7	6.5
	t/year ^d	104,700	146,580	77,795	66,940	124,611	100,409	93,600	52,000
2035	t/h ^c	7.32	9.76	6.48	5.20	10.89	6.50	6.69	8.4
	t/year ^d	62,820	83,760	55,568	44,626	93,458	55,783	53,520	67,200
Forecasted Decrease ^e	%	75	64	66	49	41	67	52	64

^a: The values are taken from Table 4-2 above.

^b: The values are taken from Table 4-2 above.

^c: Estimations are based on the hourly thermal fluid flow rates and estimated mass fractions of CO₂ in the thermal liquid provided in ESIA Addendum 2018.

^d: Yearly estimations are based on average yearly working hours of GPP units provided in Table 3-2. Total Emission = hourly emissions (t/h) x yearly working hour.

^e: Forecasted Decrease as a Percentage from 2020 until December 2035.

Source: ESIA Addendum Report, 2018

The total annual GHG emissions as well as the total GHG emissions per 1 MWh of gross production are estimated for the year of 2020 for Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs as provided below in Table 4-4 through use of the annual gross production values for 2018, the emission rates of CO₂ in terms of tonnes per hour calculated for March 2018 (as given in Table 4-2) and the annual operating hours provided by the Project Company for 2018. For Efe-7 and Efe-8 GPPs, the production values projected in their national EIA Reports are utilized for the year of 2020 based on the assumption that they will be both in operation throughout the year and the gross production values of Efe-7 and Efe-8 GPPs in the year of 2020 will be approximately the same with the values projected in their national EIA Reports. The emission rates of CO₂ projected in their national EIA Reports are utilized along with the estimated annual operating time of 8,672 hours to calculate the total annual GHG emissions as well as the total GHG emissions per 1 MWh of gross production for Efe-7 and Efe-8 GPPs. Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs are assumed to continue their operation throughout the year

of 2020 and the gross production values of Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs actualized for the year of 2018 are used for the year of 2020 based on the assumption that they will produce approximately the same amounts.

Table 4-4. Total GHG Emissions Estimation for Gurmat-1, Gurmat-2 and Capacity Extension Project GPPs (Efe-6, Efe-7 and Efe-8) for the Year of 2020

GPPs		Generation (MWh / annum)	GHG Emissions (tCO ₂ e / hr)	Annual Operating Time (hr / annum)	GHG Emissions ⁹ (tCO ₂ e / annum)	GHG Emissions (tCO ₂ e / MWh)
Capacity Extension Project	Efe-6	219,983 ^a	19.46 ^c	8,714 ^e	169,573	0.77
	Efe-7	200,000 ^b	13.90 ^d	8,000 ^f	111,200	0.56
	Efe-8	400,000 ^b	23.17 ^d	8,000 ^f	185,360	0.46
	Total	819,983	56.53	-	466,133	0.60
GPPs		Generation (MWh / annum)	GHG Emissions (tCO ₂ e / hr)	Annual Operating Time (hr / annum)	GHG Emissions ⁹ (tCO ₂ e / annum)	GHG Emissions (tCO ₂ e / MWh)
Gurmat-1 Project	Galip Hoca	373,254 ^a	31.49 ^c	8,114 ^e	255,514	0.68
Gurmat-2 Project	Efe-1	391,737 ^a	27.00 ^c	8,646 ^e	233,442	0.60
	Efe-2	215,312 ^a	19.05 ^c	8,582 ^e	163,486	0.76
	Efe-3	215,476 ^a	10.09 ^c	8,716 ^e	87,942	0.41
	Efe-4	214,656 ^a	18.18 ^c	8,721 ^e	158,553	0.74
	Gurmat-1 and Gurmat-2 Total	1,410,435	105.81	-	898,936	0.64
	Gurmat-1, Gurmat-2 and Capacity Extension Total	2,230,418	162.34	-	1,365,069	0.62

^a: They are assumed to continue their operation throughout the year of 2020 and the gross production values of them actualized for the year of 2018 are used for the year of 2020 based on the assumption that they will produce approximately the same amounts.

^b: For Efe-7 and Efe-8 GPPs, the production values projected in their national EIA Reports are utilized for the year of 2020 based on the assumption that they will be both in operation throughout the year and the gross production values of them in the year of 2020 will be approximately equal to the values projected in their national EIA Reports.

^c: The emission rates of CO₂ in terms of tonnes per hour calculated for March 2018 are used.

^d: The emission rates of CO₂ calculated according to the NCG values projected in the national EIA Reports for Efe-7 and Efe-8 GPPs are used.

^e: The annual operating hours provided by the Project Company for 2018 are used.

^f: The estimated annual operating time of 8,000 hours is used.

⁹: Excluding SF₆ emissions, since SF₆ emissions correspond to 0.001% of reservoir related emissions.

The estimation of the GHG emissions for Efe-6, Efe-7 and Efe-8 GPPs is performed excluding SF₆ emissions in Table 4-4 above. In Table 4-5 given below, the estimation is made including the SF₆ emissions.

Table 4-5. Summary of GHG Emissions from Efe-6, Efe-7 and Efe-8 GPPs for the year of 2020

Project Phase	Duration	Total Emissions (tonnes CO ₂ -e)
Operation Phase (NCGs)	per annum	466,133
Operation Phase (SF ₆)	per annum	4.7
Operation Phase Total	per annum	470,833

In summary, the total annual GHG emissions (tCO₂e / annum) from the Gurmat-1 (Galip Hoca), Gurmat-2 (Efe-1, Efe-2, Efe-3 and Efe-4) and Efeler (Efe-6, Efe-7 and Efe-8) GPPs excluding SF₆ emissions are estimated as 1,389,980 tonnes CO₂e for the year of 2020 as presented in Table 4-4 above. The contribution of the Efeler GPPs to this total amount is 491,044 tonnes, while with the addition of the SF₆ emissions in terms of tonnes CO₂e, it increases only to 491,049 tonnes.

- The CO₂ grid emission factor in Turkey is estimated as 0.486 t CO₂/MWh for the year 2018 and presents a fluctuating increase to 0.5 t CO₂/MWh in 2022 (ESIA Addendum Report, 2018). As indicated in bold in Table 4-2 above, the average amount of CO₂ emissions is calculated as 0.506 t CO₂/MWh (corresponds to 0.506 kg CO₂/kWh) as of March 2019, which has approached the CO₂ grid emission factor defined for the year of 2022. Taking the total gross production data as of February 2019 for all of the operating GPPs as 154,217 MWh (as given in Table 4-6), and multiplying it with the average amount of CO₂ emissions calculated as 0.506 t CO₂/MWh as of March 2019, the monthly average amount of CO₂ emissions can be estimated as 78,034 tonnes. For projects that currently produce, or are expected to produce post-investment, more than 25,000 tonnes of CO₂-equivalent annually, the Project Company will quantify these emissions in accordance with the EBRD Methodology for Assessment of Greenhouse Gas Emissions as required by the EBRD's 3rd Performance Requirement.

Table 4-6. Production Data as of February 2019 for the GPPs in Operation

Name of the GPP	Production Data (as of February 2019)		
	Gross Production (kWh)	Internal Consumption (kWh)	Net Production (kWh)
Galip Hoca	31,924,910.00	4,361,750.00	27,563,160.00
Efe-1	33,041,284.00	4,978,441.00	28,062,607.00
Efe-2	17,637,560.00	2,175,940.00	15,461,820.00
Efe-3	17,780,468.00	2,385,371.00	15,395,097.00
Efe-4	17,666,250.00	2,220,472.00	15,445,778.00

Name of the GPP	Production Data (as of February 2019)		
	Gross Production (kWh)	Internal Consumption (kWh)	Net Production (kWh)
Efe-6	17,756,688.00	2,116,208.00	15,640,480.00
Efe-7	18,410,040.00	2,154,960.00	16,234,910.00
Total	154,217,200.00	20,393,142.00	133,803,852.00

Source: Gürmat Electric

Pursuant to the Intended Nationally Determined Contribution (INDC) of Turkey for achieving the ultimate objective of the United Nations Framework Convention on Climate Change, Turkey targets up to 21 percent reduction in GHG emissions from the business-as-usual level by 2030 in line with its national circumstances and capabilities. In this way, Turkey aims to contribute to the collective efforts to combat climate change and step on low-carbon development pathways compatible with the long-term objective of limiting the increase in global temperature below 2°C¹⁶.

The results of the monitoring studies as well as the modeling studies discussed above demonstrate compliance with the targeted reduction level in GHG emissions. Furthermore, Gürmat Electric conducts studies of various methods of CO₂ capture including full reinjection to make “zero-emission” possible.

Gaps with the PRs and GIIP

No gaps have been identified.

Recommendations

As pointed out in the ESMAP’s Technical Report (2016), systematic collection of gas emission data from geothermal projects financed by the World Bank, other multilateral development banks, and project financiers would help to rapidly build up a data set that could provide a more precise picture of the evolution of GHG emissions from geothermal plants over time. Such a data set may not allow accurate prediction of future trends in undeveloped systems, but an expected range of potential GHG emissions variations could be established. It would not impose additional costs on the project operators. It would just be a matter of collecting the information in a central repository for further analysis (The International Bank for Reconstruction and Development, 2016).

Accordingly, the Project Company will quantify these emissions in accordance with the EBRD Methodology for Assessment of Greenhouse Gas Emissions as required by the EBRD’s 3rd Performance Requirement. The scope of GHG assessment shall include all direct emissions

¹⁶ https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Turkey/1/The_IND_C_of_TURKEY_v.15.19.30.pdf

from the facilities, activities and operations that are part of the project or system, as well as indirect emissions associated with the production of energy used by the project. Quantification of GHG emissions will be conducted by the client annually and reported to the EBRD.

In this regard, the monitoring of the GHG emissions will be continued at all operating plants. The frequency of the GHG measurements will be monitored and reported annually. A detailed breakdown by quarters of GHG emissions will be provided to the Lenders as part of the Annual Environmental and Social Report (AESR), including an update on the progress of any supplemental measures taken to reduce emissions.

The Project Company will continuously evaluate applicable mitigation alternatives to reduce carbon emissions in the short term to medium term and implement technologically and economically feasible alternatives with the aim to operate the Plants for average carbon emissions below the National Grid Emission Factor (GEF) level in the long term. The Company will develop a GHG reduction program through:

- Operational control and re-injection,
- Carbon capture and storage/ use/ selling to 3rd party industries,
- Other feasible techniques.

The Project Company will also commission an independent review of Best Available Techniques (BAT) for GHG emission reduction and develop a feasibility study to be presented to the Lenders on options available. The study will aim to identify the most technically and economically feasible means to reduce GHG emissions, thus establishing new benchmark for the industry, and a competitive position for Company.

A monitoring system will be installed at the Efe-8 GPP and monitoring will be started when the Efe-8 GPP is commissioned.

4.4 Water Resources

Current Status of Compliance with the Related PRs and GIIP

The ESIA Addendum Report (2018) elaborates that all GPPs within the scope of the Project (Efe-6, Efe-7 and Efe-8 GPPs) utilize/will utilize a reinjection system, where the reject fluids are reinjected back into the reservoir, with no waste fluid discharge to the receiving environments but for the NCG emissions discharged to air as mentioned above (see Section 4.3 above). Therefore, impacts on soil, surface water and groundwater environments are avoided completely. The production and reinjection wells data as of September 17, 2018 for Efe-6, Efe-7

and Efe-8 GPPs are provided below in Table 4-7, from which it can be seen that very large proportions of the flow rates for production are reinjected back into the reservoir.

Table 4-7. Production and ReInjection Wells Data for Efe-6, Efe-7 and Efe-8 GPPs as of September 17, 2018

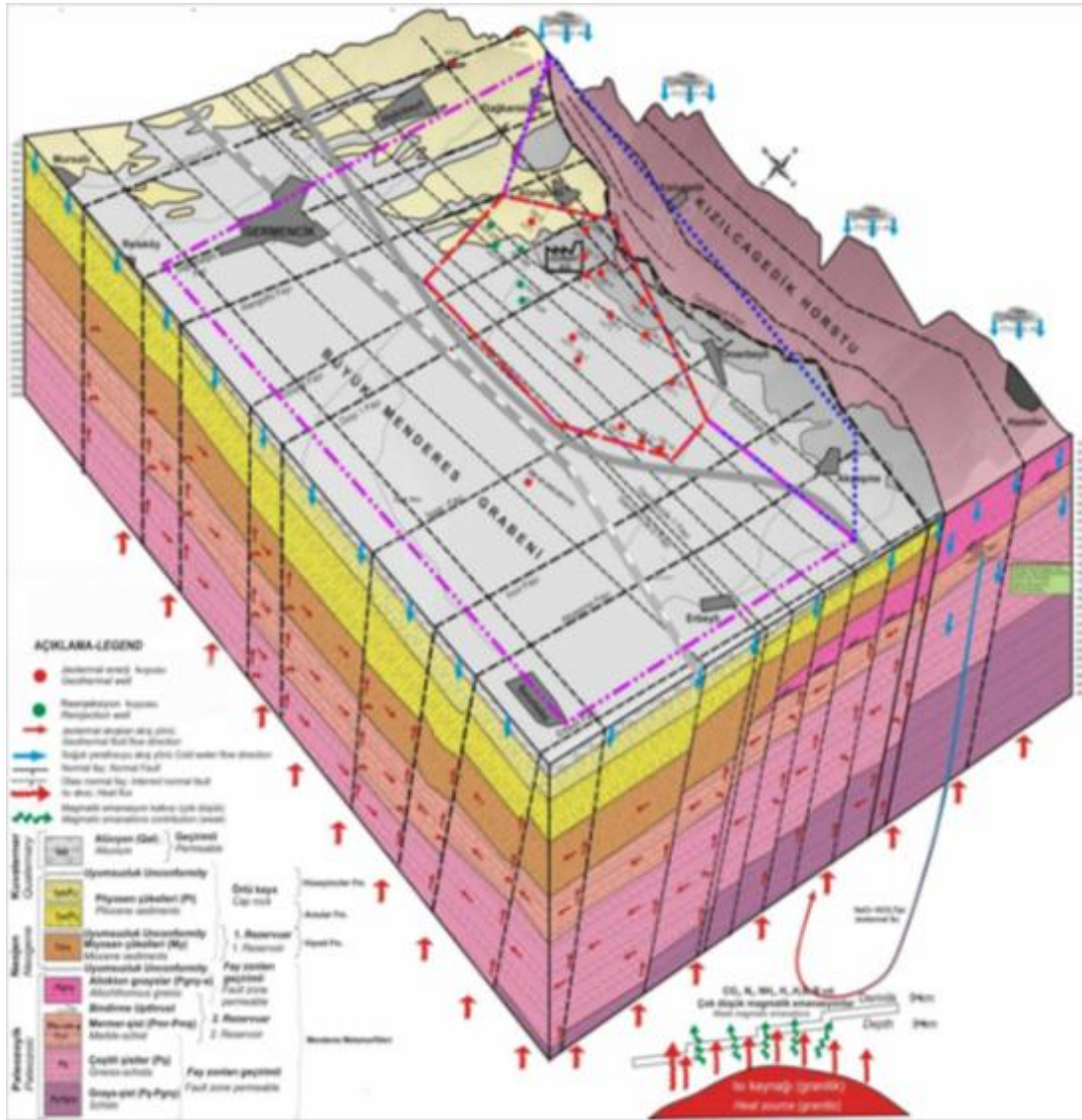
Name of the GPP	No. of the Planned Production Wells	No. of the Tested Production Wells	Total Flow Rate for the Power Plant (tph*)	No. of the Planned ReInjection Wells	No. of the Tested ReInjection Wells	Total ReInjection Flow Rate (tph)
Efe-6 22.6 MW (Binary)	9	9	1,620	7	7	1,350
Efe-7 25 MW (Binary)	6	5	1,675	5	2	1,650
Efe-8 50 MW (Binary)	12	1	2,875	15	4	2,800

*: tonnes per hour

As specified in the Environmental and Social (E&S) Eligibility Criteria for Geothermal Projects¹⁷, the project design should incorporate reinjection of the used geothermal fluid into the aquifer from which it was withdrawn to minimize the potential impacts on the geothermal resource in terms of resource sustainability and any potential risk of ground subsidence that may occur due to the reservoir depletion, especially in sedimentary geology. In this way, geothermal resources are conserved while release of pollutants into the environment is completely avoided except the cases of equipment failures. Nevertheless, considering the fact that the extraction and reinjection of geothermal fluids may affect the quality and quantity of surface and groundwater resources, in the case of inadvertent introduction of geothermal fluids into shallower productive aquifers during extraction and reinjection activities, hydrogeological investigations have been carried out within the scope of the Efe-8 GPP Project, in particular. Although the resulting Hydrogeological Investigation Report dated February 2019 has specifically been prepared for the Efe-8 GPP Project, the license area where the Efe-8 GPP Project site is located, also comprises the Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4, Efe-6 and Efe-7 GPPs, all of which are in operation. The license area is located in the Menderes Graben, which is demonstrated in Figure 4-3.

¹⁷ The Environmental and Social (E&S) eligibility criteria have been prepared to assist and to support EBRD's partner Financial Intermediaries (FIs) who are considering the provision of financing to sponsors/developers of geothermal power projects.

The eligibility criteria are organized with reference to EBRD Performance Requirements (PR), as defined in the 2014 ESP.



Source: Hydrogeological Investigation Report dated February 2019 for the Efe-8 GPP Project

Figure 4-3 Conceptual Geothermal Model of the License Area and its Vicinity

As part of the Hydrogeological Investigation Report (February 2019), hydrogeological investigations have been carried out to identify any impacts that may be caused due to the construction and operation phases of the Efe-8 GPP Project on the aquifer structures, feeding areas, groundwater resources, wells and springs in the Project region, as well as on the drinking and utility waters used by the surrounding settlements. Hydrogeological studies have also aimed at specification of the corresponding mitigation measures. The Hydrogeological Investigation Report (February 2019) particularly refers to and builds on the Geothermal Consultancy Report prepared for Gürmat Electric Generation Co. Inc. in 2012 by Professor Şakir Şimşek in the Department of Hydrogeological Engineering at Hacettepe University in addition to the Hydrogeological Survey Report of the General Directorate of the State Hydraulic Works

developed for the Lower Büyük Menderes Basin in 1975. Taking into account the logs of the geothermal drillings made by the Project Company in the Project area, which establish that the thickness of the alluvial levels showing the characteristics of an aquifer varies between 0 - 200 m as referred to in the Hydrogeological Investigation Report (2019), the geothermal fluids may inadvertently introduce into these shallower productive aquifers during extraction and reinjection activities. As indicated in the Hydrogeological Investigation Report (2019), the Hydrogeological Survey Report of the State Hydraulic Works (1975) already points to the groundwater contamination resulting from the infiltration of geothermal fluid into the groundwater resources along the Omerbeyli Faultline (the permeability coefficient of the alluvial levels in the Lower Büyük Menderes Plain is $T = 500 - 3,000 \text{ m}^3/\text{day}/\text{m}$ while the permeability coefficient of the alluvial fans in the Lower Büyük Menderes Plain increases up to $10,000 \text{ m}^3/\text{day}/\text{m}$ according to the results of the Hydrogeological Survey Report (1975) of the State Hydraulic Works as referred to in the Hydrogeological Investigation Report (2019)). In this respect, the geothermal wells to be opened, will be drilled with sealed rigs to an average depth of 1,000 meters. Then, the drilling process will be continued with open filtered or sealed equipment according to the formations encountered. In addition, there will be leakproof double casings of the wells and cementing between these leakproof casings to prevent seepage/leakage and interconnectivity between the geothermal fluid pumped up or reinjected back and the groundwater table(s) intersected by the well.

At present four existing drilling wells (SK-1, SK-2, SK-3 and SK-4) from each of which separate samples were collected to identify the baseline geochemical conditions of the aquifer structures in the Project region within the scope of the studies conducted for the Hydrogeological Investigation Report (2019). The coordinates of these wells are provided in Table 4-8 and their locations are also shown on the map given in Figure 4-4. The analysis of heavy metals was conducted in these groundwater samples and the results are provided in Table 4-9.

In order to monitor any interaction with the hydrogeological environment during the geothermal drillings and energy production activities, 4 additional observation wells (GK-1, GK-2, GK-3 and GK-4) are suggested in Hydrogeological Survey Report (2019). These monitoring wells will be submitted to 21st Regional Directorate of the State Hydraulic Works for approval within the framework of Hydrogeological Survey Report and the 21st Regional Directorate will make final decision on the number and locations of wells to be drilled. The coordinates of these wells are provided in Table 4-8 and their locations are shown on the map given in Figure 4-4. Samples will be taken from these observation wells on a seasonal basis and analysed with respect to the defined physical and chemical parameters (depth, static level, temperature, salinity, electrical conductivity, pH, dissolved oxygen, hydrogen sulphide (H_2S), alkalinity, copper (Cu), zinc (Zn), mercury (Hg), lead (Pb), iron (Fe), manganese (Mn), cadmium (Cd), arsenic (As), total suspended solids (TSS), total organic matter, total organic carbon (TOC)). The wells will be monitored continuously through a water level recorder, and the monitoring results and chemical

analysis results will be shared with the 21st Regional Directorate of the State Hydraulic Works on a seasonal basis.

Table 4-8 Coordinates of the Planned Observation Wells (GK-1, GK-2, GK-3 and GK-4) and Existing Drilling Wells (SK-1, SK-2, SK-3 and SK-4)

Well No.	Status	Coordinates	
		x	y
Observation Well / GK-1	Proposed*	557283.820	4194923.860
Observation Well / GK-2	Proposed*	558549.068	4190633.356
Observation Well / GK-3	Proposed*	559326.150	4192666.420
Observation Well / GK-4	Proposed*	560690.400	4192631.930
Existing Drilling Well / SK-1	Open well	558316.030	4191120.256
Existing Drilling Well / SK-2	Open well	555438.073	4191378.924
Existing Drilling Well / SK-3	Open well	554409.194	4192615.729
Existing Drilling Well / SK-4	Open well	560572.715	4192603.388

* Number and exact coordinates of the monitoring wells are subject to approval of 21st Regional Directorate of State Hydraulic Works. In this respect, monitoring well(s) will be drilled after approval process.

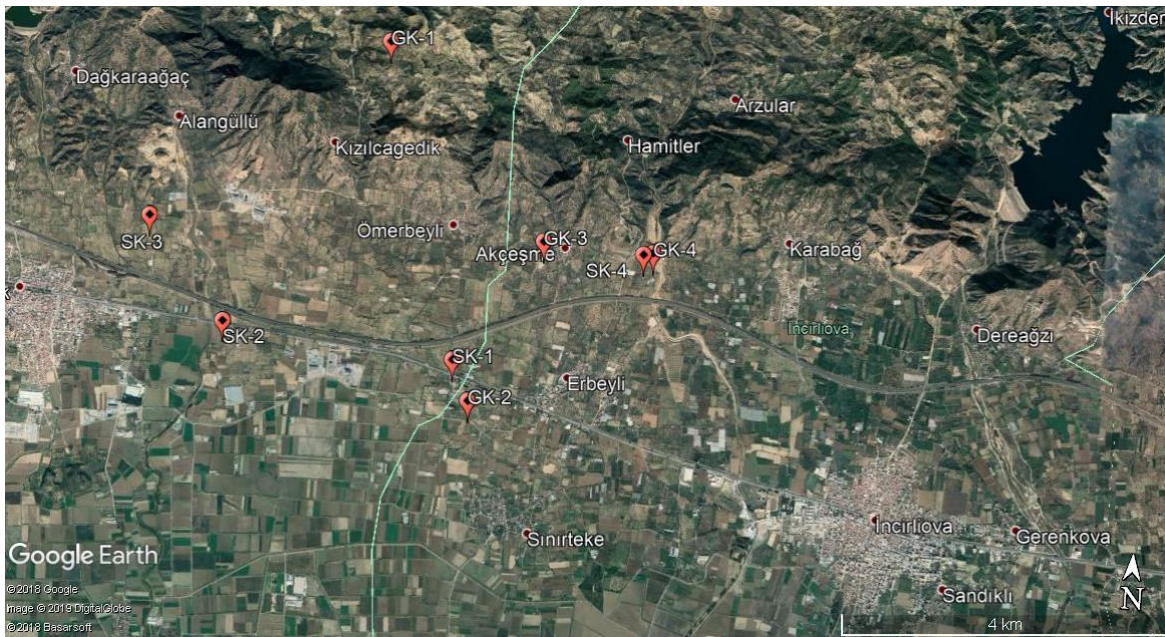


Figure 4-4. Locations of the Planned Observation Wells (GK-1, GK-2, GK-3 and GK-4) and Existing Drilling Wells (SK-1, SK-2, SK-3 and SK-4)

Table 4-9. Chemical Analysis Results for the Groundwater Samples

Analysed Parameters	Results for the Existing Drilling Well No. 1 / SK-1	Results for the Existing Drilling Well No. 2 / SK-2	Results for the Existing Drilling Well No. 3 / SK-3	Results for the Existing Drilling Well No. 4 / SK-4
pH	6.8 (22.9°C)	6.9 (22.8°C)	6.6 (22.7°C)	7.6 (22.7°C)
Electrical Conductivity (at 20.0 °C)	2,370	1,734	1,986	765
Alkalinity (mg CaCO ₃ /L)	1,266	660	922	377
CO ₃ ²⁻ (mg/L)	<10	<10	<10	<10
HCO ₃ ⁻ (mg/L)	1,479	771	1,077	440
Na (mg/L)	186	186	180	43.4
K (mg/L)	12.5	15.6	9.58	8.10
Ca (mg/L)	162	137	271	49.3
Mg (mg/L)	205	76.8	69.5	67.9
Si (mg/L)	23.8	18.5	20.0	6.50
NH ₄ ⁺ (mg/L)	<0.1	<0.1	<0.1	<0.1
Mo (mg/L)	<0.01	<0.01	<0.01	<0.01
Sr (mg/L)	0.88	0.37	0.55	0.22
Al (mg/L)	0.01	<0.01	0.06	<0.01
Li (mg/L)	0.2	0.5	0.04	0.04
Pb (mg/L)	<0.01	<0.01	<0.01	<0.01
Zn (mg/L)	0.04	<0.01	0.01	<0.01
Cd (mg/L)	<0.01	<0.01	<0.01	<0.01
Co (mg/L)	<0.01	<0.01	<0.01	<0.01
Se (mg/L)	<0.01	<0.01	<0.01	<0.01
Cu (mg/L)	<0.01	<0.01	<0.01	<0.01
Ni (mg/L)	0.01	<0.01	<0.01	<0.01
Ba (mg/L)	0.28	0.18	0.20	0.10
Fe (mg/L)	0.07	0.10	2.70	<0.01

Mn (mg/L)	0.60	0.08	0.01	<0.01
Cr (mg/L)	<0.01	<0.01	0.04	<0.01
B (mg/L)	4.1	5.4	5.3	0.2
Br⁻ (mg/L)	0.9	0.8	0.8	<0.1
F⁻ (mg/L)	<0.1	0.7	<0.1	0.2
NO₂⁻ (mg/L)	<0.05	<0.05	<0.05	<0.05
SO₄²⁻ (mg/L)	43.9	84.1	46.2	71.9
Cl⁻ (mg/L)	268	267	257	27.5
NO₃⁻ (mg/L)	11.7	10.0	2.92	15.1
PO₄³⁻ (mg/L)	<0.1	<0.1	<0.1	<0.1
Hg (mg/L)	<0.005	<0.005	0.008	<0.005
As (mg/L)	<0.01	<0.01	<0.01	<0.01

According to the national EIA Report for the Efe-6 GPP Project, there are no natural river drainage patterns in the vicinity since groundwater and surface water are controlled by the drainage and irrigation channels. The pipeline routes for all Project GPPs were designed to ensure that these channels are not impacted by the Project activities.

As specified in the ESIA Addendum Report (2018), all GPPs within the scope of the Efeler GPP Project (Efe-6, Efe-7 and Efe-8 GPPs) utilize/will utilize¹⁸ air-cooled condenser systems, whereas a water-cooled system will only be used for cooling of turbines and generators. Therefore, the operational water requirement is kept to a minimum, consisting mainly of domestic water requirement for personnel. Hereby, the Project Company minimizes its consumption of water for the GPPs in operation. For domestic water requirements, no groundwater or surface water resources are used/will be used during the construction and operational phases of the Efeler GPPs. Instead, utility water and potable water are/will be supplied by purchasing. Therefore, there is/will be no on-site impact on water availability.

In addition, there are four domestic wastewater treatment plants within the sites of the operating GPPs, one of which is the Efeler Wastewater Treatment Plant with a capacity of 80 m³/day, and the second one is for the use of Galip Hoca GPP with a capacity of 10 m³/day. The third one is for Galip Hoca and Efe-6 GPPs and the fourth one is for the use of Efe-1, Efe-2, Efe-3 and Efe-4, each of which has a capacity of 6 m³/day. Additionally, a new domestic wastewater treatment plant is established for the use of Efe-7 GPP, which has a temporary operation certificate since April 2019. The treated domestic wastewater is stored in impermeable tanks and used for irrigation of the plantings within the sites for the GPPs. For the Efe-8 GPP Project, wastewater generated by the workers will be collected in a leak proof septic tank and is/will be periodically collected by the Metropolitan Municipality of Aydin through vacuum trucks to be disposed in the Domestic Wastewater Treatment Plant of the Metropolitan Municipality of Aydin.

In case of rare emergencies, such as equipment or pipeline failures and well blow-outs, the existing geothermal fluid storage ponds of Gurmat-1 and Gurmat-2 GPPs, as well as a new pond constructed for the Efe-6 GPP will be utilized. In addition, all generation activities will be stopped in case of any emergency situation where the existing storage capacities are likely to be surpassed. The fluids stored in these ponds will later be re-injected back into the reservoir.

Following completion of the drilling works, some test studies are conducted for determination of the physical and chemical characteristics of the geothermal fluid. If found to be suitable, the collected geothermal fluid is moved to the geothermal fluid storage ponds that are already in place.

¹⁸ Efe-8 GPP Project is still in the construction phase.

The geothermal fluid collected in these ponds is later re-injected back into the reservoir. In case this option is not possible, the geothermal fluid collected in the mud pits (i.e. not the geothermal fluid ponds but the impermeable ponds located in the well sites) will only be discharged to receiving environments once related tests are conducted by licensed laboratories and compliance with the discharge limits set by the national Water Pollution Control Regulation is ensured. Required treatment will be carried out prior to discharge in case the test results indicate that the tested parameters are not in compliance with the Regulation.

Gaps with the PRs and GIIP

No gaps have been identified.

4.5 Waste Management

Current Status of Compliance with the Related PRs and GIIP

With reference to the Internal Inspection Reports dated December 2018 for Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs as well as for Galip Hoca GPP, non-recyclable domestic solid wastes and packaging wastes are collected in closed containers located at several points within the power plant sites and transferred by the Germencik Municipality of Aydın and disposed off in the solid waste landfill of the metropolitan municipality.

The list of the process wastes provided in the Internal Inspection Report dated December 2018 for Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs, is as given below:

- 13 01 13 (Other hydraulic oils),
- 15 01 10 (Contaminated packaging materials),
- 15 02 02 (Contaminated wastes),
- 16 01 07 (Oil filters),
- 16 05 06 (Laboratory chemicals),
- 20 01 21 (Fluorescent lamps and other mercury-containing wastes).

As stated in the Internal Inspection Report dated December 2018 for Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs, a Waste Management Plan with the approval date 24.08.2016 and no. 96035153 is in place. Moreover, the waste oil analysis is in place and the types and amounts of hazardous waste and waste oil as of 2017 have been declared to the related governmental authorities.

According to the Internal Inspection Report dated December 2018 for Galip Hoca GPP, an Industrial Waste Management Plan approved by Aydın Provincial Directorate of Environment and Urbanization on 13.04.2017 with the letter no. E.3211 is in place. Moreover, the waste oil analysis is in place and the types and amounts of hazardous waste and waste oil as of 2017 have been declared to the related governmental authorities.

For the Efe-7 GPP, the latest monthly audit report dated February 2019 indicates that non-recyclable domestic solid wastes are collected and transferred by the Germencik Municipality of Aydın and disposed off in the solid waste landfill of the metropolitan municipality. For the recyclable domestic solid wastes such as packaging wastes, a contract should be made with a licensed recycling company. For the non-hazardous wastes, there should be a temporary storage area. In case any waste oils are generated, their analysis should be conducted.

In brief, the Project Company achieves environmentally sound disposal of wastes in line with PR3. In the case of this Project, waste disposal is transferred offsite and conducted by third parties. Accordingly, it is ascertained by the Consultant that the solid waste landfill of the metropolitan municipality, where non-recyclable domestic solid wastes generated at the GPP sites are disposed off, is being operated to the acceptable standards. A satellite image of Aydın Metropolitan Municipality Landfill Site is provided below in Figure 4-5.



Figure 4-5. Satellite Image of Aydın Metropolitan Municipality Landfill Site

The waste management issues have also been addressed in the Environmental and Social Management and Monitoring Plan (ESMMP) established and presented in Appendix-E for the Project.

Gaps with the PRs and GIIP

No gaps have been identified.

4.6 Hazardous Materials Management

Current Status of Compliance with the Related PRs and GIIP

Within the Internal Inspection Reports dated December 2018 for Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs as well as for Galip Hoca GPP, the material safety data sheets (MSDSs) for the hazardous substances and materials are in place and up-to-date. The Project Company applies appropriate risk management measures in order to minimise or control the release of such substances/materials into ^{the}air, water and/or land resulting from their handling, storage, use and disposal relating to the Project activities. For the Efe-1, Efe-2, Efe-3, Efe-4 and Efe-6 GPPs, the BEKRA declarations for the System for Reducing Major Industrial Accident Risks have been updated and the GPPs have been excluded from submission of the BEKRA declarations. The BEKRA declaration for the Galip Hoca GPP has also been updated and the Galip Hoca GPP has also been scoped out.

The storage tanks of n-pentane (the secondary working organic fluid), which is categorized as hazardous, have been provided with secondary containment structures, however the conformity of the secondary containment structures with the given standards should be checked. The storage tanks of n-pentane (the secondary working organic fluid) should be provided with appropriate secondary containment structures capable of containing the larger of 110 percent of the largest tank or 25% percent of the combined tank volumes and made of impervious, chemically resistant material.

The hazardous substances and materials management issues have also been addressed in the Environmental and Social Management and Monitoring Plan (ESMMP) established and presented in Appendix-E for the Project.

Gaps with the PRs and GIIP

No gaps have been identified.

4.7 Labour and Working Conditions

This section has been prepared to check labour and working conditions of Efeler GPP Capacity Extension Project against the EBRD PR-2 Labour and Working Conditions.

The information provided in this Section is based on the assessment activities as given below:

- Interviews with the managerial staff of the Project Company,
- Review of documents related with employment and labour management,
- Site walkover including the accommodation areas and dining areas,
- Focus group discussion meetings and the surveys with the Project workers.

The overall objective of this labour assessment is to determine the significant labour issues and assess the existing human resources policies and procedures of the Project. As per PR-2, the Project Company is required to take reasonable measures to ensure to follow labour and working conditions according to Turkish Labour Law (Law No:4857) which is based on the International Labour Organization (ILO) core standards.

The following documents were reviewed for the gap analysis of the human resource management:

- Human Resources Policy;
- Human Resource Procedure;
- Request and Complaint Form;
- Records of workers including; age, sex, job description, birth place;
- Personnel Regulation;
- Workers' Contract;
- Supplier Evaluation Form; and
- Procurement Procedure.

Previous Assessment

The previous Labour and Working Conditions assessment was held in October 2018 by AECOM within the scope of the ESIA Addendum Report.

The status of compliance with PR-2 based on the findings of the ESIA Addendum Report (2018) is as follows:

- The existing HR procedure is not in line with EBRD PR 2 requirements (i.e. prevention of child labour, forced labour, tolerance of workers associations, retrenchment principles and encouragement of non-discrimination).
- The grievance mechanism is not allowing for documentation of the entire grievance process.

As of March 2019, it is seen that the aforementioned gap has not been fulfilled and these issues are discussed in the relevant headings.

Assessment Methodology

The assessment of Labour and Working conditions held in March, 2019 through primary and secondary data.

The primary data were obtained through structured questionnaires filled out by workers anonymously and focus group interviews. In this context, 51 structured questionnaires were applied and 5 focus group meetings were held.

The focus group interviews conducted at the site are as follows:

- Security guards: 3 participants,
- Construction site group: 10 participants,
- Shift workers: 9 participants,
- Worker representatives: 4 participants,
- Women: 4 participants.

A total of 81 workers participated in both quantitative and qualitative interviews, which shows that 34% of the total employees were consulted.

Through quantitative and qualitative interviews, availability of the workers contracts, trainings, child labour, forced labour, discrimination, working and accommodation conditions, access to drinking water, access to sanitary facilities, access to the grievance mechanism, wages, overtime and compensation and freedom of association issues are discussed.

General Labour Statistics

As of March 2019, Guris Holding Co. Inc. employs total of 239 workers including its five subsidiary companies. Women workers constitute 3.35% and disabled individuals constitute 2.51% of total employees. The employees originating from within the provincial borders of Aydın are 151 which is 63.18% of the total employees. The labour figures of workers are summarized in the table below

Table 4-10. Labour Statistics

	Number of Employees	Percentage %
Local (Birthplace Aydın)	151	63.18
Moved to Aydın	77	32.22
Expat	5	2.09
Staying at Workers Accommodation	10	4.18
Men	231	96.65
Women	8	3.35
Disabled	6	2.51
Total	239	

Source: Gürmat Employee Manual

Construction period labour figures of Efe-8 is provided in Table 4-11 below.

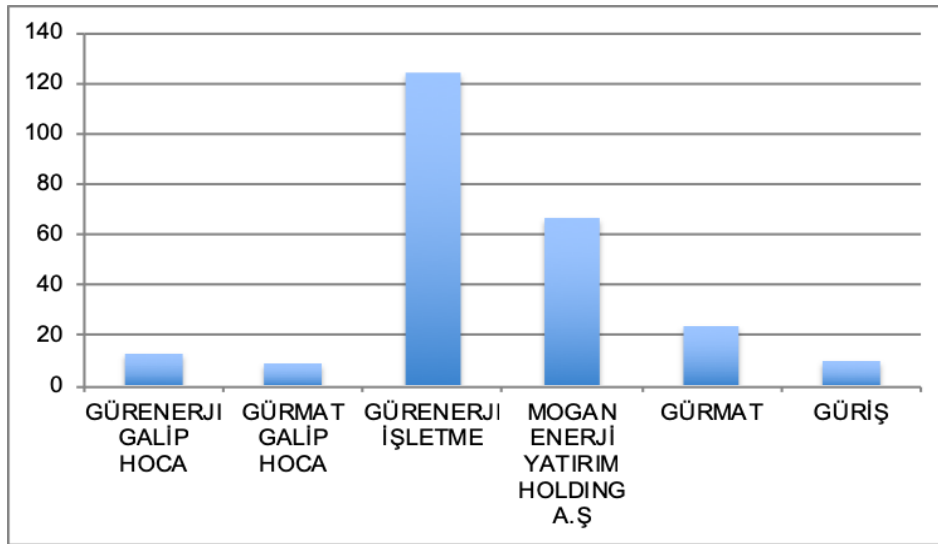
Table 4-11. Labour Statistics of Construction of Efe-8

	Number of Employees
Guriş	60
Subcontractor (Construction)	40
Subcontractor (Mechanical)	150
Subcontractor (Electric)	40
Subcontractor (Drilling)	55
Total	345

Source: Gürmat Employee Manual

According to Project Company number of workforce to be hired for operation phase of Efe-8 is expected to be 12 employees.

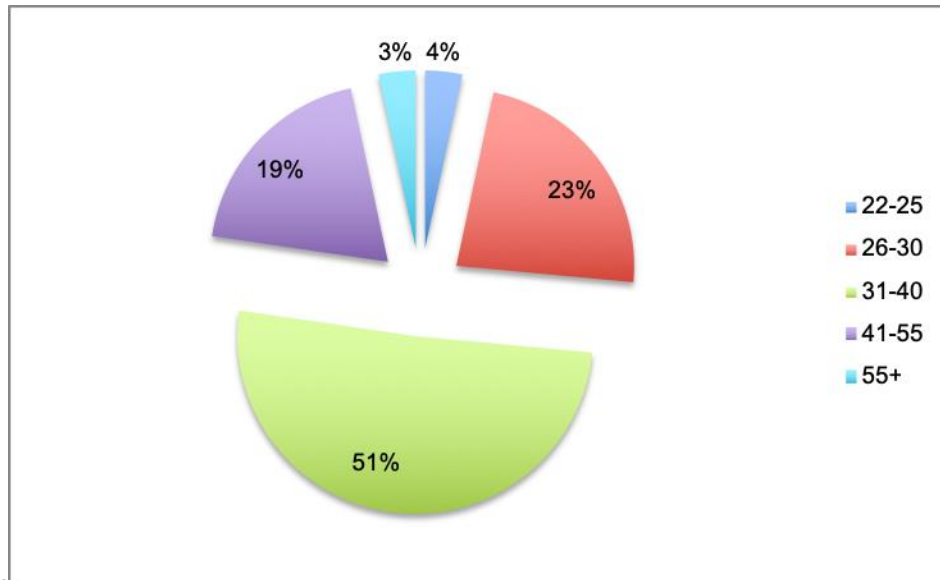
Within the scope of the Project, there are 5 sub-companies affiliated to Guris Holding Co. Inc. Among these companies, Gürenerji has the highest workers ratio with 124 people. The companies and the number of personnel connected to these companies are presented in the Figure below.



Source: Gürmat Employee Manual

Figure 4-6. Number of Workers According to the Companies

According to the Employee Manual, the youngest employee is 22 years old and the oldest employee is 65 years old. The number of workers according to the age groups is presented in the chart below.



Source: Gürmat Employee Manual

Figure 4-7. Number of Workers According to Age Groups

4.7.1 Human Resource Policies and Working Relationships

Current Status of Compliance with the Related PRs and GIIP

There are 3 people working in the Human Resources department. The department uses a CV pool and the candidates, who are qualified are interviewed by the relevant managers.

During the recruitment, tetanus card, residence record, diploma, health report, CV, criminal record are being requested by the Company. The Company requires annual health checks including lung, hearing and blood tests. Site doctor is leading the health check process and the health records of the employees are kept confidential.

Within the scope of the Project, Human Resources Policy, Employee Manual, Human Resources Procedure, and Grievance Form and Personnel Regulation have been prepared but the workers are not informed about the HR Management and these documents are not physically given to the workers.

All workers have indefinite terms of contracts. Copies of the contracts are given to all employees and subcontractors involved in all project phases. The contract includes personal information of the worker, job description, place of work, duration of the contract, trial period, temporary work assignment, working time, overtime payment, compensation work, shifts and wages.

The personnel regulations include the following topics.

- Recruitment,
- Working conditions,
- Duties and responsibilities of staff,
- Performance evaluation of staff,
- Financial and social rights,
- Security and disciplinary provisions,
- Service termination,
- Corporate culture and ethical rules,
- Privacy,
- Car allocation,
- Business trips,
- Work order and permission,
- Procurement,
- Legal transactions,
- IT,
- Clothing and uniform principles.

The main principle of the HR Policy of the Company is non-discrimination including; religion, language, race, gender, marital status, physical disability. According to the HR Policy, the aim of the Company is to:

- Select the- right personnel in accordance with the Labor Law,
- Ensure the continuous development of personal and professional qualifications of the employees by having relevant and vocational training,
- Evaluate and reward the performance of the employees fairly,
- Support teamwork,
- Provide a healthy and peaceful working environment for the employees.

The Company's HR Procedure also contains Organizational Principles, Principles of Recruitment, Trade Unions and Collective Labour Agreements, Occupational health and Safety and Collective Dismissal.

Summary of Interviews with the Workers

All respondents were direct workers and hired via contract within the scope of the Project. 90% of the participants were informed about the content of the contract during the recruitment process. 66.7% of the participants were provided with a hard copy of the contract by HR department. The following table presents the participation levels of the workers related with the content of the contract.

Table 4-12 Participants' Participation Levels related to the Content of the Contracts

Content of the Contract	Yes (%)	No (%)
Information about your position	96	4
Work place	98	2
Duration of your contract	43	57
Salary	98	2
Overtime	92	8
Working hours	100	0
Compassionate leave	82	13
Annual leave	86.3	13.7
Maternity leave	80.4	19.6
Breastfeeding permission	41.2	58.8
Notice period	81.6	18.4
Human resources policies, grievance mechanism, OHS and worker handbook references in the Contract	63	37

Source: ESIA Addendum, Labour Survey, 2019

Recommendations to Close These Gaps

Construction of Efe-8:

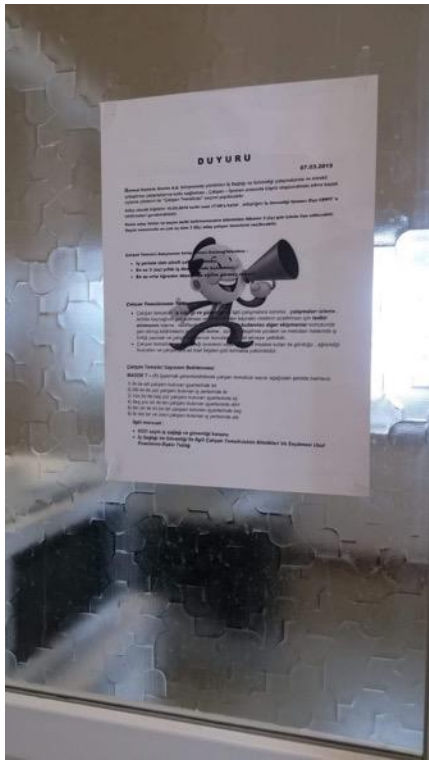
- Commitment 1 Gürmat and its contractors must continue to meet the labour force need from the local community and shall develop clear measurable Key Performance Indicators (KPIs) for construction phase for local employment in compliance with HR policy and procedures.
- Commitment 2 Gurmat and its contractors will integrate the same standards in their HR policy and procedures and the Company will monitor their compliance against the agreed the HR related policy and procedures.

Operation of Efeler Extension Project:

- Commitment 3 The HR Procedure and Personnel Regulation documents will be integrated and non-discrimination commitment has to be addressed by these documents including religion, language, race, gender, sexual orientation, marital status, physical disability, political opinion, place of residence and unionisation,
- Commitment 4 During the recruitment process it is recommended to develop and implement equal opportunities programme to encourage women applicants to apply for the jobs in order to increase gender equality in the workforce.
- Commitment 5 Considering the small percentage of women workers it is recommended to have support in technical consultancy on gender awareness.
- Commitment 6 Copies of employment contracts and HR policy/procedures will be provided to the workers as an attachment of the contract.
- Commitment 7 During the orientation process, training on HR policy and procedures will be provided
- Commitment 8 Personnel regulation and HR Policy needs to be updated including, freedom to join association, breast-feeding permit, forced labour and minimum working age, bribery, gifts, conflict of interest, training, and community involvement.
- Commitment 9: Gurmat shall develop clear measurable Key Performance Indicators (KPIs) for operation phase for local employment in compliance with the HR policy and procedures.

4.7.2 Workers Organizations

Current Status of Compliance with the Related PRs and GIIP

Photo 4-1. Announcement of the Election of the Workers' Representative 	There are no trade union activities among the workers. There were 11 representatives who have been appointed within the framework of the Labor Law as of April 2019. Human Resources Policy, Human Resource Procedure and Personnel Regulation do not contain information regarding workers organization.
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Summary of Interviews with the Workers

According to the survey, 52% of the workers do not have adequate information about the trade union rights and legal rights related to collective bargaining.

Workers' representatives are responsible for communicating the complaints of the workers to the management during the internal board meetings. However, there is no feedback mechanism for this process. The general complaints of the workers are being discussed with OHS, engineers and coordinators during the board meetings.

According to the interviews, it has been observed that grievance mechanism is not suitable for the construction site activities especially considering the urgent cases.

Recommendations to Close these Gaps

- Commitment 10 Personnel regulation needs to contain information about employees' right to joining a union at their choice and right to collective bargaining in line with the PR 2 requirements of the EBRD. This information will be shared with the workers at the time of the recruitment and throughout their employment period. Training on Freedom of association rights of employees will be provided to the management.
- Commitment 11 The representative will be elected in every five years according to the national requirements. If the employee representative leaves her/his job for any reason, the second candidate will be appointed according to the results of the previous election. The worker representatives shall be selected by the workers themselves in compliance with PR 2 requirements.

4.7.3 Wages, Benefits, and Conditions of Work

Current Status of Compliance with the Related PRs and GIIP

See Section 4.7.1.

Summary of Interviews with the Workers

According to the surveys, social security insurance and salaries were paid in time. It is seen that more than 90% of the participants are aware of OHS, PPE and OHS audits, storage of hazardous materials and emergency preparedness procedures. According to the result of survey, the rate of dissatisfaction with the food is 21.6% and workers requested Company to conduct a satisfaction survey about the food services.

The salaries were paid regularly to workers' bank accounts. In addition to the wages, transportation and food are provided by the company.

It is observed that the shift workers have one rest day in a week. The shift schedule was reviewed to understand overtime and short turnovers and it is seen that the shift schedule is in compliance with the national legal limits.

Recommendations to Close these Gaps

- Commitment 12 In the labour contract, as stated in Article 12, "For the compensation of the overtime he/she can either use 1.5 hours of free time (leave) or overtime payment depending on the workers request". However, it is observed that the overtime fee is paid only to the blue-collar workers, while overtime compensation is given to other workers as a rest day.

- Commitment 13 Worker scheduling should be re-assessed by the management.
- Commitment 14 The staff shortage in Efe-6 must be eliminated as soon as possible.
- Commitment 15 Short turns between the shifts should be eliminated even though the current implementation is in compliance with the national legislation,
- Commitment 16 It is recommended to conduct feedback survey about the food services.

4.7.4 Retrenchment

Current Status of Compliance with the Related PRs and GIIP

There has not been a collective dismissal until now due to the on-going construction works. The main Engineering Procurement and Construction contractor that is also a sub-company of Guris Holding Co. Inc. In case of dismissal of workers, Turkish labour law will be applied. According to the law; when the employer contemplates collective terminations for reasons of an economic, technological, structural or similar nature necessitated by the requirements of the enterprise, the establishment or activity, he shall provide the union shop-stewards, the relevant regional directorate of labour and the Public Employment Office with written information at least 30 days prior to the intended lay-off. If there is a union representing the workforce, they have to notify the union as well as the Ministry of Labour/ISKUR.

Guris Holding Co. Inc. has a one type of indefinite term of contract and it has been used for the construction works as well and EPC contractor is transferring the construction workers to other on-going projects in the region. HR Procedure has a section related with the collective dismissal. According to the procedure:

- Before performing a collective dismissal, an analysis will be conducted to search for alternative solutions.
- In case of collective dismissal, a retrenchment plan will be developed without discrimination in accordance with laws.
- Fair and objective selection criteria will be developed.
- Collective dismissal notices will be submitted to the relevant public authorities and to EBRD.
- All costs will be paid to employees, a time determined.

Summary of Interviews with the Workers

Information level about retrenchment is not adequate by the 44.9% interviewed workers.

Recommendations to Close these Gaps

- Commitment 17 For the construction staff, whom not will be transferred to other construction projects by the Company, a demobilization plan will be prepared
- Commitment 18 For construction and operational staff, a Retrenchment Plan in line with EBRD guidance will be prepared in case of dismissal of for 10 or more employees,
- Commitment 19 The plan of collective dismissal must be submitted to EBRD at least 30 days before the collective dismissal.

Commitment 20 The Retrenchment Plan will be prepared according to the format given in EBRD Retrenchment Guideline and it shall indicate that the redundancy process will be conducted based on objective criteria and in consultation with workers and worker's representatives and with a commitment that the workers will receive the payment of their legal rights at the time of the dismissals

4.7.5 Employee Grievance Mechanism

Current Status of Compliance with the Related PRs and GIIP

The Project does not have a formal grievance and complaints are expressed face to face.

Verbal communication prevents record, follow-up and feedback of the grievances. It also blocks to raise any anonymous complaints.

The OHS unit of the facility conducted a pilot study to present the complaints in a written form and a complaint box was placed in the workshop unit.

In this context, a complaint form was developed. Complaint form includes the following topics, but is not designed to allow anonymous complaints.

- Contact Information and Preferred method of communication
- Description of Incident or Grievance
- Date of Incident/Grievance
- What would you like to see happen to resolve the problem?

The complaints were opened during the board meeting with the participation of the workers' representatives.

3 complaints from workers were reviewed until March 2019 as follows:

- the water temperature,
- lack of leisure activities,
- greenhouse installation.

The complaint about the water temperature has been resolved, the complaint about the leisure activities is in the evaluation phase, and the complaint about the greenhouse has been rejected since it will decrease the reservoir. It has been observed by 2U1K that the complaint boxes are not located in the common use area and the workers were not informed about the procedure.

Summary of Interviews with the Workers

Complaints are preferred to be communicated through face to face meetings instead of placing official grievances through the grievance mechanism. The direct and indirect workers were observed to believe face to face consultations regarding the complaint is the most efficient way to resolve and the formal grievance process is not commonly preferred among the worker' norms.

Recommendations to Close these Gaps

- Commitment 21 An effective grievance mechanism for workers has to be established by consulting the workers. The mechanism should be shared with workers (including contracted workforce), which also includes anonymous grievances.
- Commitment 22 In addition to face-to-face complaints, tools such as mail, telephone, complaint form will be used and all complaints will be recorded in order to follow-up the complaints.

4.7.6 Supply Chain

Current Status of Compliance with the Related PRs and GIIP

There is no subcontractor other than catering company at existing operational GPP sites. In this respect, all workers are directly hired by the subsidiary companies of Guris Holding Co. Inc. With this intention, HR implementations are applicable for all Project workers including the construction workforce.

The Company has a Contractor Management Procedure and Supplier Evaluation Form. In accordance to the procedure, the company regularly monitors its suppliers. On the other hand,

there is no official record regarding monitoring of sub-constructors. Key recommendations to close the gaps on the supply chain are given below.

Recommendations to Close these Gaps

Commitment 23 In relation to the requirements for labour standards in the supply chain, the Supplier Evaluation Form has to cover child labour and forced labour.

Commitment 24 The Company will ensure that the appointed project contractors and suppliers have access to Health, Safety, Environmental and Quality and HR training as required by the Project.

Commitment 25 The Company will include requirements for sub-contractor's contracts that all contractors recruit in accordance with the Company's HR policy,

Commitment 26 KPIs will be defined to monitor the suppliers of the Company for the construction and operation phases of the Project including HR policy, child labor forced labor and non-discrimination.

4.7.7 Workers Accommodations

Current Status of Compliance with the Related PRs and GIIP

According to the consultations with the workers, only 10 employees are staying in the workers accommodation. The duration of the employees residing in the workers accommodation is observed to range between 2 weeks to 7 years. The size of the rooms is around 20 meters and have TV, single bed, work desk, WC- shower, TV and refrigerator, heating, iron and washing machine which is in compliance with Workers' accommodation: processes and standards A guidance note by IFC and the EBRD (range from 10 to 12.5 cubic metres (volume) or 4 to 5.5 square metres (surface)).

According to the Project Company there will be no need to place additional workers accommodation for the construction of Efe-8 as the current accommodation has sufficient capacity.

Photo 4-2. A Room in the Workers' Accommodation Building



Since the majority of the employees are from the Province of Aydın and the other workers, who came from the other cities of Turkey, have rented houses in the region, only 8 workers are accommodated in the labour camp. The conditions of the camp were checked.

The workers' rooms in the camp areas were visited. The rooms are single bed and have work desk, WC- shower, TV and refrigerator and heating for individual use.

There is also a TV and tearoom that can be used by workers in their spare time.

Bottled water is being used for drinking in the camp area.

According to the information received, the cleaning of the camp area is done on a daily basis. There is also a washing machine and an iron for common use.

During the focus group discussions with the workers, two workers stated that they are using the workers camps and there were no complaints related with the camp conditions. The only field observation related with the camp area was empty first aid boxes.

Recommendations to Close these Gaps

- Commitment 27 The camp doctor will supervise the camp conditions to ensure, first aid kits adequate to the number of employees staying in the camp and first aid kits are adequately stocked.
- Commitment 28 It is not required to establish a camp management plan since the conditions of the camps are appropriate and only 8 employees are using the camp. However it is recommended to conduct periodic monitoring by OHS team.
- Commitment 29 Ensure camp conditions of Contractors during the construction phase are in line with the IFC/EBRD Guidance for Worker Accommodation camps

4.7.8 Security Personnel Requirements

Current Status of Compliance with the Related PRs and GIIP

Private security services are carried out within the framework of Law No. 5188 on Private Security Services (2004). This Law covers the issues related to the granting of private security permits, licensing and supervision of the persons and organizations that will perform this service.

Security service to companies is subject to the permission of the governor on the decision of the private security commission. According to the law, the duties of private security officers:

- Searching of persons with detectors, using X-ray devices or similar security systems,
- Capturing and searching for persons in their area of duty who have an arrest warrant or conviction,
- In case of natural disasters such as fire, earthquakes and in case of emergency, to enter workplaces and residences in the area of duty,
- Informing the governmental officers police and gendarmerie immediately in case of a crime,
- Abandoned and found items to be taken into custody,
- Protecting the scene and evidence,
- The use of force according to articles 24 and 25 of the Turkish Penal Code.

It should be noted that Private security officers can perform their duties in the borders of their duty area and they do not have the authority to remove their weapons out of the facility.

Private Security Certificate is issued by private education institutions. Every Turkish citizens, at least high school graduate, without criminal records, with minimum age of 21 can receive this certificate. The training consists of 120 hours. After training sessions candidates participates the written examinations and fire test.

The work license will be effective for five years as of the date of issuance of the identification card. At the end of this period, a recent health report, legal registry record and private security renewal training certificate are needed for the renewal of the working license.

There are 37 security personnel and a security supervisor. All security personnel are male. Two of the security officers are from other provinces and 35 of them are from Aydın. The age scale of security officers is between 25 and 43. Excluding one of the officer, the rest of the security guards are armed. The majority of the security guards (30 employees) were gatekeeper during the construction period. Since there is no construction activity in the field, instead of collective dismissal of the gatekeepers, the Company provided security personnel training and the guards have successfully passed the necessary examinations and promoted to the status of an armed private security officer on 14 March 2019. Related training was provided by Oyak Security.

Persons who cannot provide the necessary conditions for security duties are also employed in positions such as tea-making and gardening.

To do list in case of emergency safety are hanged on the boards. Apart from this, there is no security procedure used in the facility.

Summary of Interviews with the Security Staff

Focus group discussions were conducted with 3 security officer. Participants have been working in the facility for 3 to 6 years.

Since the facilities are in operation period, the facility does not require gatekeepers. Therefore the guards have been certified as security guard. The duty of the gatekeepers was limited to ensuring the safety of construction materials, however, security officers have the authority to hold and interrogate suspicious people within the facility.

All employees received their training from Oyak Guvenlik. The training period is 20 days and after training all security personnel receive fire test biannually. Within the scope of the training, different power plants were also visited to see the safety related practices on site.

There one security supervisor in the hierarchical structure, and the remaining 37 security officers have the same job description. Responsibilities of the supervisor are to prepare shifts, to inform security officers about the visitors, to provide contact with the governmental bodies, to provide paperwork and dress code.

The duties of the security officers are to ensure the protection of the facility, to patrol in the region, to inform the fire brigades for stubble burning, to monitor the camera records, to search on vehicles entering the facility and to check the identity of the visitors and to monitor the traffic safety within the facility areas.

It was stated in the interviews that there was no strike organized by the workers until this date. But even if the action was to take place, it was stated that they had no authority to intervene. Participants stated that they do not have information about the events in Kızılcahöy. They stated that there was no psychological pressure on them, the biggest pressure was to protect the insulation materials. In the security training they received, they emphasized the importance of good relationship with the local people. When the villagers come to express a complaint to the facility, the security officers did not turn away them. They listen to public and they call the related unit.

The importance of the use of proportional power was emphasized by the participants. The security team is armed. It was also stated that there is no violence history of the security personnel of the Company against to local people.

Recommendations to Close these Gaps

- Commitment 30 Provide fit-for-purpose Conflict Management and Human Rights Training to the security personnel by qualified trainer (e.g. firm holding an International Code of Conduct (ICoC) certificate).
- Commitment 31 An effective and culturally appropriate grievance mechanism needs to be established for both Project workers and community for the expression concerns about the security personnel.
- Commitment 32 Security arrangement with the Gendarmerie needs to be assessed with the participation of Gürmat to discuss un-proportional force.
- Commitment 33 A management plan for security personnel needs to be developed and implemented by the Company, outlining expectations around security, in line with Voluntary Principles on Security and Human Rights (VPSHR), the UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, the UN Code of Conduct for Law Enforcement Officials and the International Code of Conduct on Private Security Providers.
- Commitment 34 The grievance mechanism for the Project will capture all grievances raised in relation to security and safety issues. These will be addressed promptly and actions will be taken.

4.8 Health and Safety

4.8.1 Occupational Health and Safety Management

Over the past decade, Turkey has been engaged in a process of reform of its national OSH system, harmonizing it with international and regional standards regarding national as well as enterprise level requirements for prevention and risk assessment reflected, inter alia, in the ILO Occupational Safety and Health Convention, 1981 (No. 155) ratified by Turkey in 2005. Turkey also ratified the Occupational Health Services Convention, 1985 (No. 161) in 2005 and has been a party to the Labour Inspection Convention, 1945 (No. 81) since 1951. Most recently, in 2014, Turkey ratified the Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187). This reform process has involved a reshaping of national OSH legislation and has included the adoption of a new stand-alone Occupational Health and Safety Law (Law No: 6331 on 20 June 2012). OHS Law, which is generally applicable across all sectors, attributes central importance to prevention and risk assessment and is aimed at continuous improvement of national OHS conditions for all workers. Since its adoption a number of related OHS regulations have been revised or updated.¹⁹

¹⁹ <https://www.ilo.org/ankara/projects/osh/lang--en/index.htm>

Current Status of Compliance with the Related PRs and GIIP

Companies that exist in Turkey regardless of the main activity they are involved in are obliged to comply with the local legislation, namely, Law No: 6331, Occupational Health and Safety Law and related regulations and communiques. Geothermal power plants having the NACE Code “35.11.19 Electrical Energy Production”, are classified by the Communiqué on Workplace Hazard Classes Regarding Occupational Health and Safety, as a workplace, where highly dangerous works are conducted. Thus, based on their number of employees, occupational safety experts, occupational medical doctor and occupational medical staff have to be employed or these services have to be provided by an accredited Common Health and Safety Unit, a health and safety consultancy company. The Project Company and the contractor companies responsible for the operation and maintenance of the geothermal power plants fulfilled this obligation by assigning occupational safety experts, occupational medical doctor, and occupational medical staff hired by accredited Common Health and Safety Unit companies.

According to Article 22 and 23 of OHS Law and Article 4 of the Regulation on Occupational Health and Safety Committees, employers are responsible to establish H&S committees, where there are 50 and/or more employees working for more than 6 months at a workplace and are responsible to coordinate communication and collaboration in regard with the health and safety issues with the subcontractors they have. The companies have to select and assign health and safety committee members and have to establish monthly health and safety committee meetings, whenever the total employee number including their subcontractors exceeds 50 employees for at least 6 months at the site. Thus, the main employer has to coordinate, communicate and cover the subcontractors’ monthly committee meeting requirements. Gürmat Electric Generation Co. Inc. has an OHSAS 18001:2007 certified occupational health and safety management system in place for its main location. The certificate was issued on October 2, 2017 and is valid till October 1, 2020. Other locations, which are covered with this certificate, are not listed as part of this certificate including Efeler GPP and the existing documents are mainly covering construction activities.

According to Article 7 of Occupational Health and Safety Services Regulation, The Project Company and their contractors established approved H&S record keeping books, where the occupational health and safety expert and the occupational medical doctor records and reports the identified non-compliance issues, necessary measures and precautions to be taken to eliminate and/or minimize the risks and recommendations. By law, any findings and/or recommendations recorded on the approved H&S record-keeping book is accepted to be declared to the Employer Representative and has to be eliminated within an acceptable period of timeframe. The approved H&S record-keeping book has to be made available for review during any audit by the authorized occupational auditors. In addition to that, any documents and records regarding health and safety related activities carried out have to be archived, periodical

health checks for the employees have to be conducted and these records have to be kept at least for 15 years after the resignation of the employee or the records have to be transferred to the approved authorities following the closure of the workplace. Tracking lists for incident/accident reporting, corrective and preventive actions taken, periodical inspection lists are not unique. There are several lists available where actions taken cannot be monitored properly.

Gaps with the PRs and GIIP

There are a number of subcontractor companies, including the companies within the structure of Guris Holding A.Ş., carrying out the works at the power plants and their auxiliary facilities. Thus, a detailed analysis and overview cannot be completed due to the high number of workplaces at each location and the complex relationship between the workplaces, due to temporary assignments of employees in between the holding companies and workplaces, which may lead to incompliance with regulatory requirements on assignment of health and safety responsibilities.

The Project Company does not have a documented Health and Safety Management Plan in line with OHSAS 18001 in place that contain health and safety plans and procedures, employee training, awareness, and reporting elements integrated into it covering power plant operations.

Several tracking lists may lead to confusion and some of the identified or reported non-compliances may have been skipped, which in turn leads to reoccurrence of an unsafe condition and/or act.

Recommendations to Close these Gaps

(CC: 4-1) A detailed list on these subcontractor companies will be prepared and the roles and responsibilities of these companies and their staff will be clarified, so that the requirements related to the occupational health and safety committee, assignment of workers representatives and other health and safety roles and responsibilities to the employees will be easily analyzed and monitored for compliance and adequacy. The Project Company does not have a requirement to establish a Health and Safety Committee as their total number of employees is below 50 for each workplace, they are operating. However the Project Company will assign an employer representative to the committee established by their contractors having more than 50 employees and will ensure that the integrated committee is carrying out their duties and responsibilities and will restructure the committee organization as per the legal requirements.

(CC: 4-2) The Occupational Health and Safety Management Plan will be aligned with OHSAS 18001 covering power plant operations and construction operations as necessary.

(CC: 4-3) Tracking lists for incident/accident reporting, corrective and preventive actions taken, periodical inspection lists will be established by the Project Company to ensure demonstration of compliance with the record keeping requirements related with OHS

Health Records

Current Status of Compliance with the Related PRs and GIIP

Health monitoring is conducted by the Project Company and records are archived at Human Resources.

Gaps with the PRs and GIIP

Due to personal information secrecy between medical doctors and their patients, Employee Health Records has to be kept locked at the Medical Room by the medical doctor. Only the assigned Occupational Medical Doctor should have the access to the locked Health Records Cabinet.

Recommendations to Close these Gaps

(CC: 4-4) Health Records will be kept locked at the Medical Room where only the assigned Medical Doctor will have the access to the file cabinet.

Working at Height

Current Status of Compliance with the Related PRs and GIIP

There is no specific procedure, training program on working at height, and no system for controlling working at height such as works to be carried on scaffolding and erection and dismantling of scaffolding.

Gaps with the PRs and GIIP

There is no specific procedure, training program on working at height, and no system for controlling working at height such as works to be carried on scaffolding and erection and dismantling of scaffolding.

Recommendations to Close these Gaps

(CC: 4-5) Professional training on working at height and its refresher trainings will be included within the annual training programs.

(CC: 4-6) The job description of the employees will include relevant identification of the employees who are working at height as part of their duties and Occupational Medical Doctor will be informed so that health records of these employees with regard to their job specific activities can be reviewed.

(CC: 4-7) A procedure on working at height will be established and this procedure will define the works that can be performed at elevated heights; information on adequate protection provided to prevent falls/accidents. Scaffolding rules and basics will be defined and an identification and registry system for the scaffolding will be developed in order to document the compliance of the scaffold erected at the site.

Incident/Accident Investigation and Record Keeping

Current Status of Compliance with the Related PRs and GIIP

Article 14 of Occupational Health and Safety Law, Law No: 6331, defines the requirements on recording and reporting of accidents and occupational diseases.

By law, incidents resulting in fatality or damages to the physical and or mental integrity of a worker have to be reported within 3 working days following the day of the incident via the online reporting system to the government. The security forces in charge of the area, where the site is located has to be informed immediately following the incident.

There is no accident/incident reporting procedure defining the reporting requirements and the roles and responsibilities. Accident/incident investigation is not carried out by a team comprehensively by carrying out a root cause analysis. NO accident statistics are kept.

Gaps with the PRs and GIIP

An improperly conducted accident/incident investigation may not identify the root causes leading the accident/incident, which may cause reoccurrence of the unsafe act and/or condition underlying in it. Accident statistics and defining KPI's for these metrics may help increasing the occupational health and safety awareness.

Recommendations to Close these Gaps

(CC: 4-8) An Incident/Accident Investigation Procedure will be issued, where roles and responsibilities are clearly defined, a comprehensive analysis of the incident/accident will be carried out where witness statements are taken and evaluated. The preventative measures and plans to manage health and safety risks in accordance with the mitigation hierarchy approach and GIIP will be prepared and implemented. The preventive actions and measures taken will be

documented. Near miss reporting cards will be available on site for visitors and contractors and for anonymous reporting.

(CC: 4-9) Accident/incident record will be kept under a single record keeping list, related root-cause analysis will be carried out by an accident investigation team and the corrective/preventive action defined will be followed via corrective and preventive actions list. Root cause analysis will identify the real root-causes other than human error.

(CC: 4-10) Key performance indicators (KPI's) will be defined for accident statistics within the Health and Safety Plan, including the metrics, definitions for all the metrics to be used, reporting requirements.

Visitors/Contractors/Interns Inductions and Instruction Forms

Current Status of Compliance with the Related PRs and GIIP

Visitors and contractors do not receive any written document declaring the general site safety rules and therefore there is no commitment received from them either.

Gaps with the PRs and GIIP

The main employer is responsible to inform the workers including the subcontractor workers regarding the dangers and risks on-site. In case of any accident/incident the main employer is responsible to provide evidences.

Recommendations to Close these Gaps

(CC: 4-11) Instructions and Statement Forms for visitors and contractors will be prepared where the general site safety rules are declared and signed commitment of the visitor or contractor is received for archiving purposes. The form will also include basic information of the person on communication details, purpose of the visit or tasks to be conducted at the site.

Contractor Management

Contracts have to include project specific OHS requirements and standards, such as, on site environment, health and safety rules, document list to be submitted (trainings, health records, certificates and licenses, safety data sheet for chemicals to be used, job specific risk assessment etc.), to ensure that the contractors provide services in line with the local and international requirements the project is subject to. Contractors have to carry out and submit risk assessment studies related to their activities prior to start to work at site.

Current Status of Compliance with the Related PRs and GIIP

There is no standard contract template identified including contract item related on occupational health safety rules and requirements.

Gaps with the PRs and GIIP

There is no standard contract template identified including contract item related on occupational health safety rules and requirements.

Recommendations to Close these Gaps

(CC: 4-12) Submission of risk assessment by the contractors will be added as a contract item and without submission and approval of job specific risk assessments by the contractors a permit to work will not be issued related to the work.

(CC: 4-13) Contractor Management procedure will be reflected in the contracts. Contract templates will be developed and used as basis for all contracts in relation with provision of services and material supply.

Risk Assessment Studies

According to Article 6 of the Occupational Health and Safety Risk Assessment Regulation, employers have to conduct risk assessments covering the workplace existing conditions, routine works to be carried out and maintenance works to be carried out, where also potential emergencies based on hazard assessment are identified. Risk assessments has to be carried out by a team established by the employer including employer representative, occupational health and safety expert, occupational medical doctor, worker representatives, support teams at the workplace, workers with specific experience related to the assessed risks. According to Article 11 of the regulation, risk assessments has to be documented, signed and archived, related preventive measures and actions have to be taken, employees have to be informed and have to be made available for use of the related teams and employees. According to Article 12 of the regulation, in case of change in working conditions and/or incidents and near misses related risk assessments have to be re-conducted and updated accordingly. Article 14 requires the main employer, the Project Company, to coordinate and collaborate in case there is more than one employer conducting works at the same workplace. In addition to those requirements, Article 15 regulates the coordination of risk assessments and related works where there exist subcontractors at the workplace. According to the Article 15, the Project Company is responsible to provide necessary documents and information required for the risk assessments to the subcontractors, has to coordinate, review and control the risk assessment works of their subcontractors. Contractors are responsible to carry out risk assessments related to their work,

submit a copy of their risk assessment studies to the Project Company and ensure that the required measures are applied and are in place.

Current Status of Compliance with the Related PRs and GIIP

The Project Company does not have a specific procedure on Risk Assessments. Risk assessments are conducted by the assigned occupational safety expert instead of a risk assessment team.

Gaps with the PRs and GIIP

Routine operational works and also specific works other than routine operations have to be risk assessed both for the construction period and also for the operation period.

Recommendations to Close these Gaps

(CC: 4-14) A risk assessment procedure will be issued. The procedure will identify the basis for risk assessment studies, selection of the team members, their roles and responsibilities, training requirements, review of the risk registers etc. Risk assessments will be carried out by a team defined by the Regulation. The risk assessment will be made available for the operation and maintenance teams so that they can use them as reference for the works.

(CC: 4-15) Risk assessments for the works carried by contractors have to be assessed by the contractor companies and be submitted to the Project Company for review. The contractor companies may only be allowed to work on site following the review and approval of their risk assessment by the Project Company.

Exposure Monitoring and Measurements

Based on the identification and evaluation to be made in the risk assessment studies, the workplaces have to be evaluated in terms of personal exposure levels and conditions. The following issues have to be monitored, measured and identified risks have to be minimized by taking corrective and preventive measures:

- Lighting,
- Thermal comfort,
- Ventilation/aeration,
- Noise exposure,
- Vibration (if identified to be conducted in risk assessment studies),

- Chemical exposures (dust, vapor) (if identified to be conducted in risk assessment studies).

Current Status of Compliance with the Related PRs and GIIP

Noise exposure maps are prepared by the Project Company for the locations; however they are not made available on site and the areas where limits are exceeded are not marked at the site. Ear protections for the visitors and/or contractors are not available on site. No measurement studies are available for lighting, thermal comfort, ventilation/aeration, vibration and for chemical exposures.

Gaps with the PRs and GIIP

The requirement on informing employees regarding the hazards and risks are not met in case the areas exceeding the noise limits are not marked on site. The non-compliances at the workplaces have to be identified and eliminated based on the measurement studies.

Recommendations to Close these Gaps

(CC: 4-16) Noise exposure maps will be made available on-site, areas exceeding the noise exposure limits will be identified and equipped with warning signs indicating the requirement of use of ear-plugs. Ear-plug dispensers will be made available at areas where the lowest noise exposure action values, which is 80 dB (A) are exceeded.

(CC: 4-17) High noise areas where personal noise protecting gear is required to be used all the time when working where the highest noise exposure action values which is 85 dB(A) are exceeded will be identified and marked.

(CC: 4-18) A personal noise exposure campaign will be held for the workers routinely working at areas with noise levels of 85 dB (A) and higher based on their job descriptions.

Health and Safety Trainings

Regulation on the Procedures and Principles of the Employee's Health and Safety Trainings, defines the minimum requirements for employee trainings to be provided by their employers.

Current Status of Compliance with the Related PRs and GIIP

Health monitoring is conducted by the Project Company and records are archived at Human Resources. The project Company is providing the compulsory health and safety trainings for their employees.

Gaps with the PRs and GIIP

Induction training is not provided to the contractor workers and visitors.

Recommendations to Close these Gaps

(CC: 4-19) The Project Company will provide an induction training for all contractor and subcontractor employees and visitors before the first entry to the workplace according to Article 5-(3) of Regulation on the Procedures and Principles of the Employee's Health and Safety Trainings. According to Article 6 of the regulation, the Project Company will provide an induction training for all their employees and subcontractor employees prior to start working at the project site, which will be minimum 2 hours and will cover general precautions to be taken at site.

(CC: 4-20) All health and safety related trainings conducted will be monitored on employee basis.

(CC: 4-21) Contractor will provide also periodical occupational health and safety training to the employees, which will be repeated annually and will be at least 16 hours covering the topics listed in the regulation. In case of any occupational incident, employers will retrain the employees having the incident.

Permit to Work

The following H&S procedures and issues have to be covered in the health and safety management system so that the H&S risks are controlled and minimized due to construction, operation and maintenance works that are carried out at the site. A permit to work procedure and a Lock Out/Tag Out (LOTO) Procedure should include written procedures, signs, locks and tags, etc. for all sources of energy e.g., electrical, chemical, hydraulic, etc. at machinery and at electrical panels. Electrical Power Plants Regulation defines safety rules required to establish, operate and maintain electrical power plants. Article 61 of the regulation defines the precautions to be taken in order to maintain workers health and safety. Operation responsible is required to provide written instructions to the workers assigned to a work, where the duration of the work, the location and the type of work to be conducted are defined. Although the minimum requirements for these written documentations are not defined, a permit to work procedure and/or documentations are the basis for GIIPs.

Current Status of Compliance with the Related PRs and GIIP

The Project Company has a permit to work form in place, and uses LOTO tools (multiple party locks and permit to work form). However, the Project Company does not have a written procedure on permit to work system other than the F.11.01 Work Permit Form. Roles and

responsibilities, the authorization structure, training requirements for operations team, flow diagram for the permit to work process are not detailed. The system consists of a single permit to work form, and does not include special permits for works like;

- Hot Work,
- Confined Space,
- Excavation Works,
- Working at height,
- Working at or HV Voltage Equipment,
- Live work on Low Voltage Equipment,
- Fire Fighting Impairment etc.

Gaps with the PRs and GIIP

A Permit to Work Form without a structured Permit to Work System is not sufficient to eliminate risks present on-site due to the inherent dangers of the power plant.

Recommendations to Close these Gaps

(CC: 4-22) The Project Company will establish a Health and Safety Plan and/or specific procedures in order to be able to document and apply specific precautions to be taken related to the works conducted within their premises and pipeline routes. The permit requirements related to these types of special works will be defined.

(CC: 4-23) A hot work procedure will be adapted to define at least welding, cutting and brazing, curtains/screens, ventilation, permit programs and clarify how to use hot work permit document, the duties of the hot work team before, during and after the completion of the hot works. The minimum requirements and precautions to be taken during hot works has will be identified.

(CC: 4-24) Confined spaces will be identified. A list of “permit required” confined spaces (turbines, condensers, cooling water towers etc.) will be prepared, those locations will be labeled and entry to these locations will be under control and kept locked. A Confined Space Entry procedure will be developed where at least the duties of the confined space watchers are defined and training rules and basis for these confined space watchers are defined including emergency rescue plan for confined space works.

(CC: 4-25) Working at height procedure will be developed to define the works that can be performed at elevated heights; adequate protection to be provided to prevent falls/accidents. Scaffolding rules and basics will be defined and an identification and registry system for the scaffolding will be developed in order to document the compliance of the scaffold erected at the site. The scaffolds will be inspected and inspection will be documented before starting to be

used, at least once a week, whenever it is modified and/or revised, not used more than a certain time frame, whenever extreme weather conditions or change in conditions are experienced. Static calculations, rules and limitations regarding scaffolding will be provided by the scaffolding tools supplier. Specific type of scaffolds that have to be erected at the site, not in compliance with the standard rules and limitations provided by the supplier, will be designed, statically calculated and approved by the authorized technical experts. Turkish Legislation defines works to be conducted at areas having elevation difference that may result in injury due to falling, as working at height. Therefore, works to be conducted at any elevation difference will be handled as working at height and will be included within the risk assessments and necessary preventive measures and precautions will be defined and provided to minimize the risks related to the work.

(CC: 4-26) A procedure to work at High Voltage and Low Voltage Equipment and Lines will be developed, the training and certification requirements for those workers will be defined clearly.

(CC: 4-27) Standard Operating Procedures will be developed for lone and isolated workers.

(CC: 4-28) Standard Operating Procedure for testing hazardous atmospheres will be developed and alarm levels regarding those chemicals will be communicated with workers, contractor workers and visitors.

(CC: 4-29) Works to be carried out outside GPP fence lines (inter-boundary) will be also conducted via a special type of permit so that the project company can control whether the necessary communications were held with the third party, and necessary precautions were taken before start of the work.

Heat

Current Status of Compliance with the Related PRs and GIIP

High temperature surfaces are not equipped with proper warning signs indicating that they contain hot fluid and the requirement for personal protective equipment (PPE) as appropriate, such as insulated gloves. Due to the nature of the work being conducted, there is high risk of exposure to hot water and/or steam during maintenance and operations activities. There were burns due to hot water splashes in 2018 according to incident/accident records.

Gaps with the PRs and GIIP

Absence of warning signs and emergency aid kits (such as burn gels and blankets).

Recommendations to Close these Gaps

(CC: 4-30) The project Company will equip the high temperature surfaces with proper warning signs that they contain hot fluid and the required PPE's to work on them.

(CC: 4-31) The Project Company will keep emergency aid kits (such as burn gels and blankets) at the site to decrease the level of affect in case of any hot water splash.

4.8.2 Community Health and Safety

Fall/Trip Hazards

Current Status of Compliance with the Related PRs and GIIP

There are mud pits next to the wells without barriers preventing accidental trips and falls. The pipe network does not have proper warning signs.

Gaps with the PRs and GIIP

Unauthorized access to well locations may result accidental falls to mud pits and unauthorized removal of insulation of the hot fluid pipelines may cause exposure to hot surfaces resulting in severe burns.

Recommendations to Close these Gaps

(CC: 4-32) The well locations will be either remotely monitored via CCTV systems and/or kept under control via security personnel. Mud pits will be closed immediately after completion of the work or necessary actions have to be taken to minimize unauthorized access to the areas.

(CC: 4-33) The pipe network system will be equipped with proper warning signs indicating that they contain hot fluid and any removal of insulation may cause exposure to hot surface.

Noise

Current Status of Compliance with the Related PRs and GIIP

Report of a Noise Measurement conducted between November 8-9 2018 at 24 locations at and within the vicinity of the three-power generation location of for Gurmat Electric Generation Co. Inc. concluded that the daytime noise levels due to activities are in compliance with the following clauses of the Regulation on Environmental Noise Assessment and Management:

- Article 22 paragraph 1.a) requires that the noise levels measured shall not exceed the limit values defined in Table 4 of Annex VII of the regulation, which is; Leq Daytime: 65

dBA, Leq Evening 60 dBA, Leq Night time 55 dBA at Intensive areas where commercial buildings and noise-sensitive uses co-exist and residential buildings are densely populated.

- Article 22 paragraph 1.b) requires that the background noise levels are not exceeded by more than 5 dBA.
- Article 22 paragraph 1.c) requires that the LCmax impact noise levels shall not exceed 100 dBC.

Gaps with the PRs and GIIP

Noise measurement report does not include an evaluation in accordance with international standards.

Recommendations to Close these Gaps

(CC: 4-34) An acoustic study will be conducted and evaluated in accordance with both national and international standards.

4.8.3 Infrastructure, Building and Equipment Design and Safety

CO₂ Fire Suppression Systems

Current Status of Compliance with the Related PRs and GIIP

There is no procedure available for the management of CO₂ protected areas and firefighting impairment conditions. Labeling of push buttons for delay of CO₂ release at the main control room were identified in Turkish and no warning signs was available.

Gaps with the PRs and GIIP

All warning signs and labeling has to be in Turkish and easy to identify and understand.

Recommendations to Close these Gaps

(CC: 4-35) Control panels of CO₂ fire suppression systems and dedicated push buttons for delay of gas release at the main control room will be clearly labeled and identified in Turkish. An emergency instruction for use of the system will be provided next to the panels and push buttons. The doors of the CO₂ protected rooms and areas will be clearly labeled indicating danger of possible release of an asphyxiant gas (CO₂) and entry to these areas will be controlled via the permit to work system by temporarily disabling the gas release system, during the time period whenever there is a person inside these CO₂ protected areas.

(CC: 4-36) A procedure for the management of CO₂ protected areas and clear instructions for application of the procedure will be issued and applied at the site. Tightness test will be conducted to ensure that effective flooding can be performed in case of an emergency (especially following any repair, dismantling and/or physical change at the gas protected rooms).

4.8.4 Hazardous Materials Safety

Hazardous Zones

Current Status of Compliance with the Related PRs and GIIP

An Explosion Protection Document was prepared, however the hazardous area zones defined were not marked at the site and no warning signs were placed.

Gaps with the PRs and GIIP

Employees have to be informed regarding the hazards and necessary preventive measures have to be taken.

Recommendations to Close these Gaps

(CC: 4-37) Hazardous Zones calculated and defined in the Explosion Protection Document will be reflected at the site. Visual warning signs will be placed and the zones will be marked on-site. Restriction on use of mobile phones will be marked wherever it is necessary.

4.8.5 Traffic and Road Safety

Current Status of Compliance with the Related PRs and GIIP

The company drivers did not receive defensive driving training and both drivers and passengers do not use seatbelts, generally. Safe access routes were not defined for project site locations.

Gaps with the PRs and GIIP

Awareness of drivers have to be increased to eliminate the risk of traffic accidents.

Recommendations to Close these Gaps

Defensive Driving

(CC: 4-38) The drivers using company cars will take defensive driving training which may increase the level of driving safely. Use of seatbelts will be checked and encouraged via awareness trainings.

Access/Egress to the Site

(CC: 4-39) The access/egress via vehicles to the sites main entrance will be reviewed in terms of traffic risks. Either the road will be revised in collaboration with the local authority or a safe route will be defined and has to be used strictly by the drivers.

4.8.6 Exposure to Disease

Current Status of Compliance with the Related PRs and GIIP

No legionella sampling was conducted at the site. No awareness training was held regarding HIV and contagious diseases.

Gaps with the PRs and GIIP

Preventive measures to be taken to control and/or eliminate any health hazards.

Recommendations to Close these Gaps

Legionnaires' disease

(CC: 4-40) A Legionella Monitoring Plan will be established, and a sampling period and schedule will be identified and monitored, accordingly. Disinfection procedures will be established and applied for the potential reservoirs of bacterial overgrowth, accordingly.

HIV and contagious diseases

(CC: 4-41) An awareness-raising program will be held regarding HIV and contagious diseases like hepatitis.

4.8.7 Emergency Preparedness and Response

Current Status of Compliance with the Related PRs and GIIP

According to the Article 5 of the Regulation on Emergency Response at Workplaces, employers are responsible to prepare emergency response plan for the site and inform the subcontractor workers, temporary workers and visitors regarding the emergency response plan adapted at the site. According to Article 17 and 18, contractors are also responsible to prepare emergency response plan specific for the area of their work at the site in cooperation with the Project Company.

There is an Emergency Action Plan in place for the Project Company and their main contractors responsible for operation and maintenance. The Plan defines emergencies (i.e. fire, earthquake,

sabotage and pentane gas related emergencies) and emergency Roles and responsibilities are defined.

Emergency prevention and response trainings and first aid trainings are provided. In addition, a fire drill was conducted in November 2018.

Gaps with the PRs and GIIP

Emergency drills conducted does not cover all incident scenarios and operational locations.

Recommendations to Close these Gaps

Emergency Drills

(CC: 4-42) Drill scenarios will be identified and planned within the Annual Health and Safety Plan and at least one scenario for fire/earthquake followed by evacuation drill will be conducted at each location. A chemical release scenarios for pentane and H₂S will be applied, in order to increase awareness and to test the scenarios in place.

(CC: 4-43) ERP will be clearly communicated to the community members, especially to the adjacent communities. ERPs will be kept up to date so that they include a complete list of emergency communication list including the municipal and governmental authorities.

(CC: 4-44) Scenarios regarding the emergencies beyond the boundaries of the sites will be defined and exercised.

Evacuation Routes

(CC: 4-45) Evacuation route maps will be hanged on buildings and structure where employees are working. The location will be marked on the map so that the user can identify the closest route to be followed in case of emergency.

(CC: 4-46) A small leaflet/brochure/pocket guide including an evacuation route map and instructions to follow in case of emergency will be provided to visitors and contractors.

4.9 Land Acquisition, Involuntary Resettlement and Economic Displacement

Current Status of Compliance with the Related PRs and GIIP

All parcels required for the Project and its associated facilities are acquired; and land acquisition is complete. The Project area had undergone land consolidation in 2013, and majority of land acquisition was completed after land consolidation. Project components that require land

acquisition include production and reinjection wells, station site, and pipelines. Land has been acquired through numerous land acquisition techniques depending on the Project component such as willing buyer seller negotiations for well and plant site, obtaining right of way for pipelines, obtaining usufructuary right for pipelines and renting. For the construction of the pipelines of the Efe-8 Project, already acquired lands and the lands on the route of State Hydraulic Works (SHW) will be used which are subject to protocol between the Project Company and SHW and protocol process is on-going. The review of land acquisition data revealed all land is acquired by willing buyer seller negotiations and there are no outstanding grievances. The Project has a public interest decision as an energy development Project. However, this decision has not been used for the land expropriation. If the Project Company could not get agreement with the landowner, neighboring lands were purchased.³⁴ PAPs are phone interviewed to assess the impact of land loss on their livelihoods. All PAPs interviewed were satisfied with the payments and verified that they were able to invest the compensation payments and acquired more replacement land. Below table summarizes Project's land acquisition.

Table 4-13 Land Acquisition Summary Table

Land Acquisition Type	Number of Parcels	Area of Land	Land Acquisition Total Cost (TRY)	m ² /TRY
Willing buyer seller	112	1,270,517	22,701,512	17.87
Right of way	21	17,972	536,057	30.5
Usufructuary rights ²⁰	22	19,385	n/a	n/a
Rental	24	20,258	986,152	47.93
Total	179	1,328,132	24,223,721	18.51

Source: Gurmat Land Acquisition data

Land acquisition for Energy Transmission Line (ETL) is being conducted by TEIAS. There is one outstanding grievance for compensation for TEIAS led land acquisition.

Gaps with the PRs and GIIP

Land acquisition is based on willing buyer seller negotiations. While compensations are said to be paid above market value for timely willing buyer seller negotiations, there is no record keeping for asset census, valuations for land and standing assets (trees, crops) versus actual payments. There is no corporate land acquisition policy and procedure that depicts Guris's land acquisition approach, commitment and valuation strategy.

Associated facilities such as transmission lines are included within the scope of EBRD's PR 5. Even though TEIAS is conducting land acquisition for transmission lines, it is the Company's responsibility to ensure all PAPs are compensated according to national legislation. Grievance

²⁰ Data for usufructuary rights dates back to 2011; and was not available. Guris stated that compensation values were similar to right of way payments.

mechanism by the Project needs to capture all land acquisition related complaints, grievances and requests.

There is no monitoring mechanism for assessing livelihood impacts on fig and olive producers in the vicinity of the Project area for the operation phase of the Project and affected land owners and land users affected by the land acquisition requirement of the Project.

Recommendations to Close these Gaps

Commitment 35 Project Company will develop a Land Acquisition (covering acquisition and leasing/rental) procedure in line with local administrative requirements and Lenders' PR5 requirements.

Commitment 36 The Company will use its best efforts to monitor the land acquisition process carried out by TEİAŞ for high voltage transmission lines against national legislation.

Commitment 37 The Company Extend Grievance Redress Mechanism (GRM) to all land-acquisition related activities.

Commitment 38 The Company will monitor operational impacts on agricultural production such as olives and fig in cooperation with Provincial/District Directorate of Agriculture and/or Chamber of Agricultural Engineers or similar recognized professional or academical parties. .

4.10 Biodiversity Conservation and Sustainable Management of Living Natural Resources

The construction works in the Project site have been completed to a large extent, the test fluids are re-injected back into the reservoir, and fragmentation of the habitats due to the piping systems was not observed as the pipes are mounted on legs and there are spaces left between the pipes and the ground which allow the flora species spread around and the fauna species wander around the piping systems easily. Accordingly, this PR has been scoped out of the ESA Report.

4.11 Cultural Heritage

The Project Company stated that in the construction phase of Efe-6 GPP, objects representing cultural heritage value or significance were uncovered in unexpected locations (i.e. chance finds), and were then placed under protection. Moreover, the area of concern was excluded from the power plant site. The Project Company also stated that neither relevant competent bodies of found objects were notified nor the Project personnel were alerted to the possibility of chance finds being discovered in the case of the chance finds in the construction phase of Efe-6 GPP.

Furthermore, the area of finds hasn't been fenced-off to avoid any further disturbance or destruction but the area of concern was excluded from the power plant site.

Recommendation to close the Gap:

A Chance Find Procedure should be put in place for use, particularly during the piping works as part of Efe-8 GPP, and for managing consultation with affected communities and other stakeholders.

4.12 Information Disclosure and Stakeholder Engagement

Background (Public Opinion Analysis)

The social experts analysed the public and media's perception on geothermal power plant projects located in Aydın province, especially in Germencik and Efeler Districts on national and local news sites and social media platforms (including Instagram, Twitter, Facebook and Youtube). Details of each platform's assessment can be found in Appendix-D.

In general, Twitter and Instagram applications are becoming preferred choice of spreading information among the social media users in Turkey. From the desktop assessment, it has been observed Twitter has the most interaction among social media users regarding the GPP topics and almost all of the Tweets and Instagram posts are regarding to Sarı Zeybek Project. In terms of local and national news websites, news articles that were directly related to Efeler GPP, covered positive impacts of the Project, especially on how the Project will address the national energy demands and the current stage of the proposed Project. Almost 90% of the media coverage or social media post regarding the Efeler GPP are positive as to this date, on the other hand, the main concerns are observed to be caused by existing experiences by the neighbouring projects and whether the implementation of this Project will cause the same disturbances to the community and environment just as Sarı Zeybek GPP.

Considering the growing number of tweets and Instagram posts regarding the opposition on regional GPPs, this Project should increase its social media involvement to spread information and clear any potential misunderstandings that may occur in the future. The Company shall continue to undertake strong mitigation measures to differentiate the Efeler GPP from the poor examples in the region.

Considering the majority of the critical concerns of the news articles or social media posts are regarding to negative environmental impacts of the GPPs, prospective engagement methods should point out the good practices of the Efeler GPPs is committed to.

The negative public and media perception of the Sarı Zeybek GPP, even though this Project is distant in terms of location, puts a negative perception in all projects located in the Aydın Province. Especially in terms of lack of information on locals, project parties of each GPP, type of activities and cooperate level strategies of the each project. Given that thought, Efeler GPP may experience bias outlook due to misunderstanding or lack of proper information regarding the Project by the locals.

YouTube could be another source of media tool to be used to increase Efeler GPP's awareness as well, either through informative videos regarding the Project or even a small commercial of the Project with indication of commitment to good practices.

Table 4-14 Sources Assessed within the Scope of the Study

Source	Number of Data Assessed
Local and National News Website	80
Twitter	54
Facebook	17
Instagram	25
YouTube	30
Total	206

Current Status of Compliance with the Related PRs and GIIP

Stakeholder engagement activities conducted to date (as of May 2019) include the activities within the scope of previous national EIA processes for the Gurmat-1, Gurmat-2 and Capacity Extension Projects (i.e. public participation meetings conducted, official correspondences and meetings conducted with the governmental stakeholders, disclosure of national EIA reports in accordance with the EIA Regulation) and activities (e.g. face to face meetings and consultations with the Project stakeholders) conducted as part of two ESIA Addendum studies. Within this scope, a public participation meeting for Gurmat-2 (Efe-1, Efe-2, Efe-3 and Efe-4) was held on October 31, 2014. For Efeler Geothermal Power Plant (GPP) Project (Capacity Extension) according to the Turkish EIA Regulation, public participation meetings were held on February 25, 2016 and December 23, 2016. Prior to these meetings (more than 10 days in advance) the meeting dates and places were announced via local media, posters and announcements in mukhtars' offices. The main questions, concerns and issues stated during these meetings were:

- Details of the operation process to be conducted at the power plant,
- Air pollution caused by geothermal power plants operating in the region,
- Impacts of air pollutants emitted from these plants on agricultural lands,
- Disturbances due to steam emitted from the stacks of the power plants.

Other than stakeholder engagement activities in the scope of national EIA requirements, the company has carried out stakeholder meetings. A meeting was held with the members of the Municipal Council of Germencik in February 2019 as a part of SEP. A tour of the facilities was carried out during the meeting and the stakeholders were informed about existing and planned social investments. The Company also engages with stakeholders through corporate social responsibility (CSR) activities. The company has organized a workshop at Germencik March 2017 with multiple stakeholders on “Living with Geothermal Energy”. Company’s CSR investments range from education to livelihood restoration through a wide array of activities. Scholarships are provided to young female university students; schools are renovated, robotics teams are supported; and a vocational high school is built to support education. Company has distributed and planted over 16,000 fig saplings in all Project affected settlements since 2009.

In order to inform stakeholders on Grievance Mechanism informative meetings were held in the settlements of Ömerbeyli, Turanlar, Erbeyli, Kızılcagedik and Dağkaraağaç. Stakeholder Grievance Form posters were also hung in 8 villages.

ESA Scoping Study

Between the dates March 12th -14th 2019 field study for Scoping Report of Efeler GPP ESA was conducted. During the site visit, in order to further identify and update the list of the stakeholders of the Project as well as to identify the key social impacts of the Project, interviews with the local institutions and stakeholders were conducted. The list of the interviewed stakeholders is shown table below.

Table 4-15 Key Informant Interviews

Non-Governmental Organizations	
1.	Aydın Bar Association President
2.	Aydın Bar Association Environment Committee President
3.	Aydın Center Yörük Türkmen Association
4.	Efeler Chamber of Agriculture President
5.	Germencik Chamber of Agriculture President
6.	Agricultural Credit Cooperative President
7.	Germencik Şehit Cafer Efe Yörük Türkmen Association
8.	İncirliova Chamber of Agriculture President
9.	İncirliova Yörük Türkmen Culture Association
Local Authorities	
1.	Aydın Province Deputy Governor
2.	Aydın Province Retired Deputy Governor
3.	Aydın Public Hospital Head Physician
4.	Turanlar Neighbourhood Mukhtar
5.	Hıdırbeyli Neighbourhood Mukhtar

- | |
|---|
| 6. Alangüllü Neighbourhood Mukhtar |
| 7. 3 Fig Producers |
| 8. Germencik District Governor |
| 9. Germencik Fig Research Institute |
| 10. İncirlioğlu Mayor |
| 11. Sınırtepe Neighbourhood Mukhtar |
| 12. İncirlioğlu Denizbank Private Bank Branch Manager |
| 13. İncirlioğlu District Governor |
| 14. İncirlioğlu District Agriculture Director |

Incorporating the results of the scoping study, the Stakeholder Engagement Plan was updated with an extended stakeholder list and improved stakeholder engagement plan for meetings and consultations that will be conducted by the Efeler GPP.

External Grievance Mechanism

There is a grievance mechanism in place with designated staff for receiving grievances, grievance phone/mail/email lines, grievance forms and record keeping. In order to improve the effectiveness of grievance mechanism the Project is performing updates on the grievance mechanism especially considering systematic record keeping of received grievances (including face-to-face meetings). After these improvements, the grievance mechanism will be announced to the public with stakeholder meetings held in project affected communities, including impacted women PAPs and vulnerable groups. Project specific modes of communication that includes a website, grievance boxes, dedicated phone line, WhatsApp line, will be available to PAPs to communicate their grievances and will allow for anonymous filing of complaints/requests.

The grievances received by the Project include use of land without consent especially for pipeline access. Compensation for grievances includes grievances from loss of crops or damages to standing crops and assets. There were no grievances on land acquisition received from mukhtars during field studies.

Between the dates March 18th 2015 and February 7th 2019, 11 grievances were recorded. 9 of the grievances are closed and 2 are still open. 4 of the grievances were about damage to land because of activities of the company, 5 were about damage to crops and 2 were about rental of the affected parcels by the company.

The grievances that are still open are about damage to land. One of the PAPs that reported these grievances has filed a court case. Below table shows the detailed number of grievances.

Table 4-16 Number of Recorded Grievances

Grievance Subjects	Number of Grievances	Open	Closed
Damage to land	4	2	2
Damage to crops	5	0	5
Rental of affected parcels	2	0	2
Total	11	2	9

Source: Guriş, 2019

Gaps with the PRs and GIIP

There is a grievance mechanism in place with designated staff for receiving grievances, grievance phone/mail/email lines, grievance forms and record keeping. Nevertheless, grievance forms are used only for grievances that cannot be responded imminently and there is not systematic grievance recording. While the staff responds to numerous requests and grievances, the records are only for large scale grievances that require a longer time period to resolve. Moreover, grievance mechanism needs to be widely announced.

SEP is a living document, and needs to be updated regularly to include all stakeholders. Project Company has conducted need-based meetings with district level Public Institutions rather than regular systematic engagement. SEP has to be understood, implemented and updated by the Community Relations team. Information sharing and stakeholder consultation need to be more inclusive of women, Project Company's previous engagement was limited from gender perspective. Moreover, stakeholder consultation lists are not kept in a compiled list; and minutes of the meetings are not recorded.

Project Company emphasizes Corporate Social Responsibility (CSR) activities. CSR activities range from adhoc need based interventions to planned scholarships for girls' education; and fig sapling distribution. However, in order to enhance agricultural production and marketing in Project's impact area, a planned approach that targets community development (CD) would be required.

Recommendations to Close these Gaps

Project Company will start implementation of the updated SEP and the grievance mechanism. The summary of the stakeholder engagement actions is provided below:

Stakeholder Consultations

- In line with SEP Project Company will conduct regular meetings with district level Public Institutions.
- SEP also defines regular information sharing and consultation meetings for affected communities and mukhtars (Omerbeyli, Kızıcagedik, Alangullu, Turanlar, Sinirteke, Erbeyli and Akçeşme neighborhoods) that the Project Company will implement.
- Implement the SEP and the grievance mechanism. As part of the SEP, maintain a register of external communications including minutes of meetings held with stakeholders. Review SEP on an ongoing basis and update as necessary.
- ESA, SEP, NTS and ESAP to be disclosed locally and on web site until the end of the third year from the COD of Efe-8. Implement the requirements of the Lenders ESIA disclosure package and National legislation. Provide an update on the implementation of the SEP and ESAP in annual external E&S performance disclosure.
- Project Company will conduct consultation/and information sharing meetings organized for women PAPs.
- Conduct external reporting to public, summarizing project progress, EHSS performance, GHG emissions, CSR (Corporate Social Responsibility) activities and other relevant information.
- Provide full data to Lenders on H2S and GHG emission on annual basis.
- Continue to implement community development projects which aim to support education and enhance agricultural production in the villages in line with the needs of the communities.
- Stakeholder consultation data will be kept in a compiled excel list with detailed information on date of engagement, stakeholder consulted, reason for engagement, main issues, and actions taken. When consultations are group based, the number of attendees needs to be kept. If brochures or information leaflets are distributed during consultations, copies will be attached to meeting minutes and included in the stakeholder consultation data sheet.

Capacity Building

- Training the social team of Efeler GPP on EBRD requirements, SEP and ESA documents.
- Use its best efforts to increase gender diversity and representativeness of the Community Relations function within Gürmat.

- Engage and consult in a gender and culturally appropriate manner, in particular ensuring the inclusion of women stakeholders.

External Grievance Mechanism

- In order to immediately record grievances received while visiting the field, a grievance form that has multiple copies will be prepared so that once the PAP states a grievance the grievance can be recorded immediately on paper and a copy of the record is given to the PAP and another copy is left with expert. These grievances forms will be placed in all vehicles.
- Allowing anonymous filing of complaints/requests in external grievance mechanism.
- Announcing the grievance mechanism (including specific modes of communication that includes a website, grievance boxes, dedicated phone line, whatsapp line etc.) to affected PAPs in affected settlements and mukhtars (Omerbeyli, Kızıcagedik, Alangullu, Turanlar, Sinirteke, Erbeyli and Akçeşme Neighborhoods).

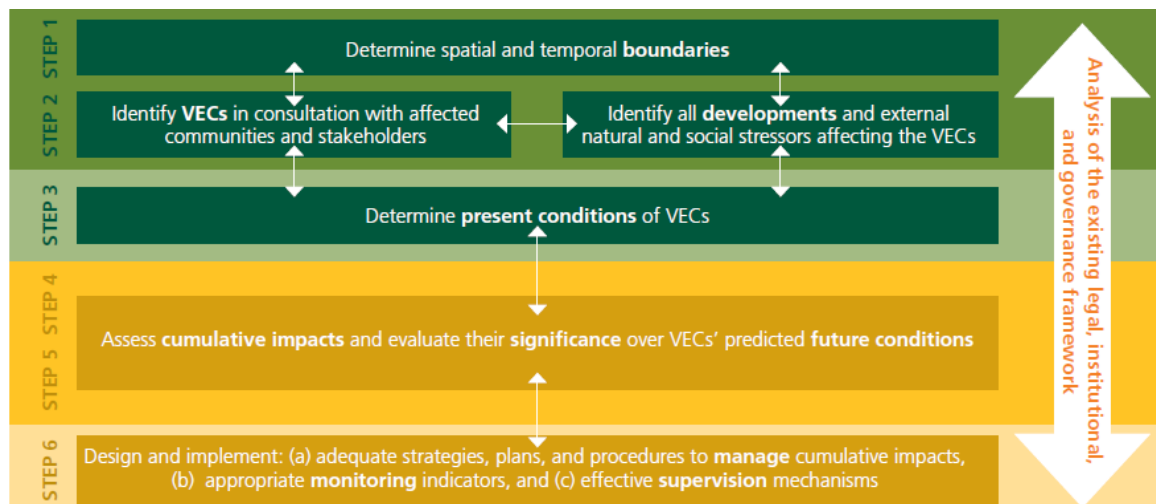
Community Development Plan (CDP)

- Continue to implement community development projects which aim to support education and enhance agricultural production in the villages in line with the needs of the communities.

5. CUMULATIVE IMPACT ASSESSMENT

Operational impacts of geothermal power projects (GPP) are considered more significant than potential impacts of construction activities, which are considered as temporary and mitigated with conventional measures. Due to that reason, cumulative impact assessment (CIA) of GPP projects is more focused on operational impacts. In other words, by considering the long operational period of geothermal projects (i.e., 50 years in Menderes Graben), cumulative impacts of GPPs in the same region are accumulation of residual impacts such as noise, treated wastewater discharge, solid waste disposal, and/or un-mitigated impacts such as NCG emissions, accidental release of geothermal fluids etc., which can be assessed as minor for a single GPP project. Additionally, social consequences of these impacts are other dimensions of CIA study.

CIA has already been performed in the scope of 2018 ESIA Addendum. In the assessment, six-step approach proposed by IFC (IFC, August 2013) is used as the study framework. The process diagram is provided in Figure 5-1 below.



Source:

IFC, August 2013

Figure 5-1 Six-step CIA Approach

Spatial and Temporal Boundaries

In the CIA study, Germencik and Incirlioiva districts are selected as the study area, since multiple GPPs are located in the vicinity as well as additional energy generation Projects that may have potential impacts on the same VESCs. Identified CIA Study Area is shown on the map provided in Figure below.

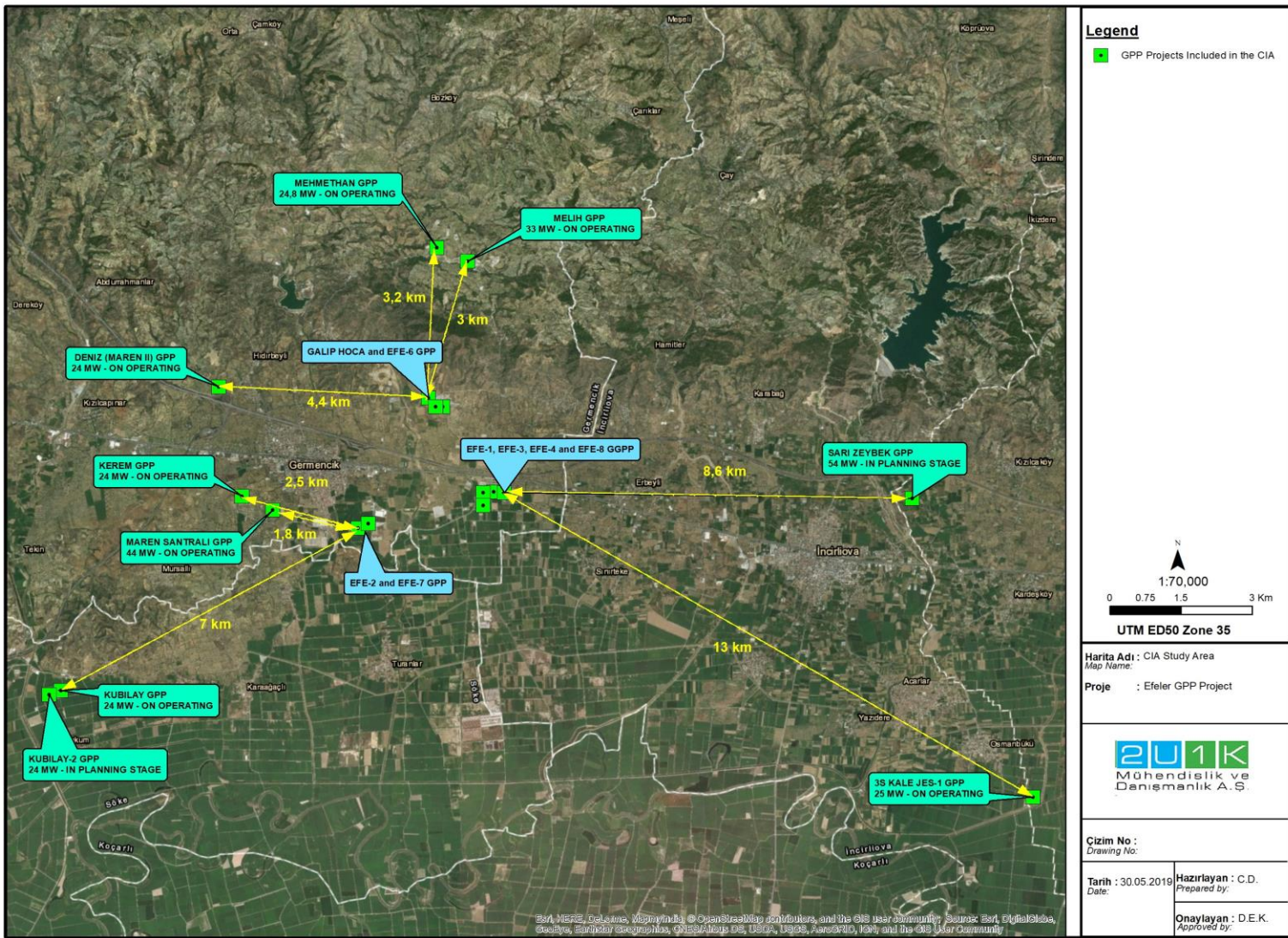


Figure 5-2 Identified CIA Study Area

Electricity Generation Licenses (EGL) for geothermal projects in the region are 49 years, in general. On the other hand, The EGL for Efe-6 and Efe-7 states more than 16 years of generation time frame. Consequently, temporal boundary of the CIA study has been determined as the Project life of the Efeler GPP, which will start with the beginning of land preparation activities and be limited with the duration of the applicable Electricity Generation Licenses.

Valued Environmental and Social Components (VESC)

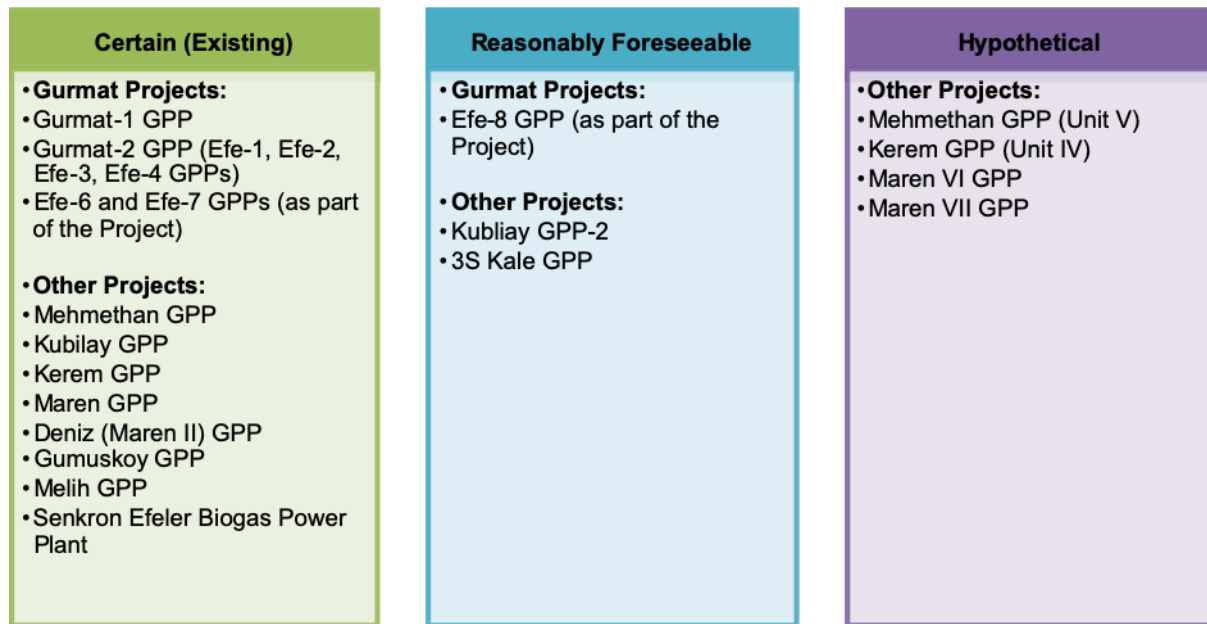
Valued Environmental and Social Components (VESC) have been identified in consideration of the previous environmental and social assessments done. Selected Environmental and Social Issues and corresponding VESC are provided in Table 5-1.

Table 5-1 Selected VESC for the Efeler GPP CIA Study

Environmental/ Social Issue	Valued Environmental/Social Components
Land use	Agricultural lands
Biodiversity and living resources	Habitats
	Priority biodiversity features
Air emissions	Air quality in local settlements
Noise	Background noise levels at local settlements
Visual environment	Visual amenity of local communities (visual receptors)
Social and economic environment	Socio-economic conditions of local communities
Induced Seismicity	Rock stress patterns

Other Activities

Efeler GPPs in the scope of Efeler Extension project were identified as the “Projects under Assessment” in the CIA study. EMRA license lists were used for identification of other projects within the CIA Study Area. In this respect, GPP projects and thermal power plant projects were identified in the study area, and these projects were classified as existing, reasonably foreseeable as well as hypothetical projects (please see Figure 5-3). Information on other projects (i.e. the projects not sponsored by Gürmat Electric) is provided in Table 5-2.



Source: ESIA Addendum Report (2018)

Figure 5-3 Projects to be included in the CIA Study

Table 5-2 Other Projects Identified for CIA

Project	District	Installed Capacity (MW)	Electricity Generation License Information			Status	Category
			Type	Start	End		
Mehmethan GPP	Germencik	24.8	Generation	21.10.2016	11.03.2039	Generation License in force	Existing
Kubilay GPP	Germencik	24	Generation	13.10.2016	05.03.2043	Generation License in force	Existing
Kerem GPP	Germencik	24	Generation	09.10.2014	09.10.2063	Generation License in force	Existing
Maren GPP	Germencik	44	Generation	30.07.2009	11.03.2039	Generation License in force	Existing
Deniz (Maren II) GPP	Germencik	24	Generation	09.05.2012	11.03.2039	Generation License in force	Existing
Gumuskoy GPP	Germencik	13.2	Generation	24.02.2011	09.02.2040	Generation License in force	Existing
Melih GPP	Germencik	33	Generation	07.12.2017	11.03.2039	Generation License in force	Existing
Senkron Efeler BPP	İncirliova	3.6 in operation, 1.9 under	Generation	03.10.2012	03.10.2027	Generation License in force	Existing

Project	District	Installed Capacity (MW)	Electricity Generation License Information			Status	Category
			Type	Start	End		
		construction				(capacity extension under construction)	
Efe-8	Germencik	15	Licence	18.04.2019	18.04.2034	EIA Positive Decision obtained	Reasonably Foreseeable
Kubilay GPP-2	Germencik	24	Prelicense	22.03.2018	22.09.2020	EIA Positive Decision obtained	Reasonably Foreseeable
3S Kale GPP-1	İncirliova	25	Prelicense	20.07.2017	20.01.2020	EIA Positive Decision obtained	Reasonably Foreseeable
Mehmethan GPP (Unit V)	Germencik	24	Generation	Denied		Generation License denied	Hypothetical
Kerem GPP (Unit IV)	Germencik	24	Generation	Denied		Generation License denied	Hypothetical
Maren VI	Germencik	24	Generation	Denied		Generation License denied	Hypothetical
Maren VII	Germencik	24	Generation	Denied		Generation License denied	Hypothetical

Source: EMRA License Database, March 2019 (<http://www.epdk.org.tr/>)

Cumulative Impacts on VESCs

Potential environmental and social issues identified within the scope of the Project national EIAs and this ESIA Addendum have been screened in consideration of identified existing and reasonably foreseeable future projects to determine potential cumulative impacts. In addition, the findings of the Commission Report prepared by the local committee authorized by Efeler Municipality to identify environmental and social risks geothermal power plants were also considered during identification of potential cumulative impacts. The impacts, which are considered in the cumulative assessment, include the following:

- Air Emissions: H₂S emissions in terms of health and safety including toxicity and odor, and CO₂ emissions in terms of climate GHG contribution,
- Terrestrial flora/fauna,
- Permanent change in the land use characteristics and loss of agricultural land,
- Vapor visual impacts,
- Microclimatic impacts,

- Potential discharge of geothermal fluids to receiving environments,
- Induced seismicity,
- Economy (services sector and employment),
- Quality of life (community investments, emissions).

The key environmental and social issues where project(s) in combination with the Project have the potential to result in cumulative impacts are summarized in Table 5-3 below. The CIA study shows that moderate level impacts can be expected due to NCG emissions (including GHG). Availability of limited mitigation alternatives on air emissions of GPP is the major cause of this risk. Mainly, NCGs are directly released to the atmosphere in order to protect the system. On the other hand, unmitigated air emissions, which have no significant impact for single project, may cause significant impacts in long time period by considering the cumulative impacts of multiple projects in a basin.

Table 5-3 Potential Cumulative Environmental and Social Impacts

Key Issues	Potential Cumulative Environmental and Social Impacts
Air emissions (NCGs)	The main NCG emission of concern other than GHGs is H₂S, which is a toxic gas and which may also affect local communities due to its malodorous character. As indicated by monitoring studies for Gurmat-1 and Gurmat-2 GPPs, which use the same reservoir with the Project, the Project's contribution to cumulative H₂S emissions is expected to be very small. Nonetheless, cumulative H₂S emissions, specifically in terms of impacts on local communities due to odor, shall be investigated by a detailed cumulative impact study to be conducted by related authorities and associations, since existence of abatement techniques and potentially affective factor such as wind patterns are unknown. Additional organizational measures/limits may be proposed as a result of any such detailed study.
Air emissions (GHGs) ²¹	Considering the fact that area reservoirs have high GHG content, the cumulative GHG emission impact is expected to have moderate significance. On the other hand, the GHG monitoring results shows that existing average GHG emissions of Efeler projects has decreasing trend (see Section 4.3) and it gets close to the National Grid Emission factor 0.50 tons/kWh defined for 2022 (EBRD, 2015) Numerical Reservoir Simulation study performed by Gurmat also supports this decreasing GHG emission trend. GHG emission estimation scenarios between 2017–2035 indicate more than %20 reduction (Turkey's target reduction level for 2030). In this respect, significance of projects contribution to GHG emission is considered to be decreased from moderate level to Minor level over long time period..
Terrestrial flora/fauna	- Cumulative impacts of the existing and foreseeable projects can be listed as; fragmentation of habitats into higher number of patches, which limit individual species' ranges in a given area, cumulative result of multiple infrastructure, synergistic effect of multiple GPPs in a given area, as well as increased mortality risk due to various project activities, including increased traffic in the area. - Although projects may be carried out by different developers, they do have cumulative impacts on landscape and biology, some of which must be assessed together. Neither the legislation nor the private initiatives in Turkey support such an approach. Therefore, it is not possible to make an assessment of cumulative impacts on biodiversity features, without adequate data from other existing and foreseeable projects in the area. International best practices also suggest that when a number of projects are planned in an area like this, it is more effective for different project owners to come to an agreement on a single cumulative impact assessment, which could also be supervised by related authorities. This would usually mean assessment of a joint impact on the same natural element, for example the same reptile population in the area, whose territory, distribution, and population status would be identified to assess impacts of various developments.
Land use and agricultural land	There will be some change in the land use characteristics in the area that will start with construction activities and persist during operation phase. The permanent land use characteristic change is especially important in terms of loss of agricultural land. The total land requirement of Efeler Project including power plants, well locations and pipelines is about 100 ha for 210 MW installed

²¹ Emission characteristic can vary between the reservoirs. In this respect, a detailed, regional cumulative study is still needed to understand the regional dimension of the GHG Emissions. With this intention, a basin level cumulative assessment s initiated by MoEU with the support of EBRD.

Key Issues	Potential Cumulative Environmental and Social Impacts
	capacity. By considering technical characteristics of the existing geothermal projects in the region, it can be said that same level of land is required for 187 MW projects. In this respect, at present about 200 ha land is used for geothermal production at Aydın Plane Section of Menderes Basin, where the %45.3 (363.215 ha) of the plain used for agricultural purpose (Aydın Province Agricultural Master Plan, 2019). The figures shows that significance level of the impact regarding permanent land take is very limited and at minor level. Additionally, the ETLs and pipelines of the projects only use easement rights instead of acquisition of the entire land parcels where these components' routes passes from and therefore, agricultural activities can continue around the small footprint corridors of these components. During the ESA consultations it is observed that all PAPs were satisfied with the payments and verified that they were able to invest the compensation payments and acquired more replacement land. It was also observed that the compensation paid to the land owners stated to be higher than the average local market price, therefore the locals purchased larger lands compared to the lands sold to the Project Company. As a result, cumulative impact on arable land is mainly limited to plant footprint areas and the impact of the Efeler Extension Project is considered as minor. However since the land requirement of the other Projects in the are is not known the magnitude of the cumulative impacts land use is cannot be foreseen.
Visual impacts	• Cumulative visual impacts of binary GPPs would result from the presence of facility structures and increased traffic load. Detailed site planning, facility design, materials selection are measures that will be applied specifically by each facility; and revegetation programs and adjustment to transmission line routing are measures that will be applied following a detailed cumulative assessment which can be conducted by related authorities or associations. • As the Project GPPs will use binary systems, their contribution to vapor in the local atmosphere will be minimal. Therefore there will be no cumulative impact of the Project GPPs in terms of visual impacts of vapor, which, in lack of proper stakeholder engagement and awareness raising activities, may be perceived as harmful gasses by local communities.
Microclimatic impacts	• Discharges of steam may have a significant effect on the climate in the vicinity of a power plants, depending on the topography, rainfall, and wind patterns. Under certain conditions there may be increased fog, cloud formation or rainfall. Microclimatic effects are mainly confined to large power schemes in high-temperature fields; utilization of low-temperature geothermal systems does not cause significant microclimatic effects. Due to the basin characteristics, Geothermal Power Plants are designed with binary production units that has limited vapour emissions. Only two units of Gurmat Projects, Galip Hoca and Efe-1 have double flash power units which have vapour emission form cooling towers. In this respect, by considering the power capacities and production technologies, significance of micro climatic impact is estimated as minor.
Discharge of geothermal fluids to receiving environments	• The Project GPPs will reinject the spent fluids directly back in to the reservoir (i.e. no discharge to receiving environments) by utilizing reinjection wells that are designed to ensure no interaction with soil or shallow groundwater environments occur. Therefore, the Project will have no impact on agricultural land, in terms of decrease in productivity due to geothermal fluid discharges.
Induced seismicity	• Induced seismicity is an issue of importance at geothermal sites where there are a large number of operational GPPs with very high generation capacities (i.e. the Geysers geothermal field in California, US, where more than 20 GPPs with a collective approximate installed capacity of 1.5 GW are operated, as opposed to the approximate 0.5 GW total installed capacity identified by this CIA, using the Germencik reservoir). Even in this case, majority of the seismic activity cannot be sensed by local communities due to

Key Issues	Potential Cumulative Environmental and Social Impacts
	very small magnitudes of 1-3. Therefore, a cumulative impact study is not of importance for the determined CIA area (cumulative impact of identified existing/future GPPs negligible). • If required by related authorities or in case multiple new plants are planned in the future years and/or specific grievances are received the issue will be reassessed.
Economy (services sector and employment)	• Cumulative economic impacts of geothermal power plants in the region will be positive in terms of providing employment opportunities for the local work force and creation of indirect work opportunities such as transportation, housing, catering, etc. • It is anticipated that competitive markets will result in improved level of services, while new businesses will also be developed based on particular demands of geothermal projects. With this intention, greenhouse applications, dry ice production, anti-fire applications are potential industries to develop. However, cooperation of geothermal power plants in the region with regional development agencies for guiding new businesses and increasing the quality of labor force through joint training activities is very important in terms of enhancing and maximizing this positive impact.
Quality of life (community investments, emissions)	• The local community benefited by the GPPs in the region through local investments in infrastructure services. The cumulative adverse impacts in the form of general public health and environment can be observed in time, as the local community began to grow concerns on the increasing number of the GPPs in the region. If environmental mitigation measures are not taken by all plants, and transparent communication is not established with the locals, negative perception to the GPPs will increase over time.

Source: ESIA Addendum Report, 2018

The potential cumulative impacts of Efeler GPP Project together with other energy generation projects identified in the CIA Study Area are summarized in Table 5-4. As can be seen, cumulative impact of GHG emissions from GPPs in the vicinity is assessed to be moderate, due to high CO₂ content of the reservoir. In addition, beneficial economic impacts due to opportunities for services sector and employment and beneficial community development impact were also assessed to have moderate significance.

Table 5-4 Interaction of Projects with VESCs

Projects		VESCs																		
		Settlements (Air Quality Impacts related to H ₂ S – incl. odor)						Global Scale/ Ecosystem Components (GHG Emissions)	Biodiversity	Land Use (Agricultural Land Availability)	Settlements (Visual Impacts/ GPP Facilities)						Settlements (Visual Impacts/ Vapor Plume)	Settlements (Induced Seismicity)	Local Communities and Regional Economy (Services Sector and Employment)	Local Communities (Quality of Life)
		Dagkaraagac	Alangulu	Kizilcagedik	Omerbeyli	Germencik	Sinirteke				Dagkaraagac	Alangulu	Kizilcagedik	Omerbeyli	Germencik	Sinirteke	Erbeyli			
Project Under Assessment	Efe-6	√	√	√	√			√	√	√	√	√	√					√	√	√
	Efe-7					√		√	√	√				√				√	√	√
	Efe-8				√	√	√	√	√	√						√	√		√	√
Existing Projects	Gurmat-1	√	√	√	√			√	√	√	√	√	√					√	√	√
	Efe-1				√	√	√	√	√	√						√	√		√	√
	Efe-2							√	√	√					√			√	√	√
	Efe-3				√	√	√	√	√	√						√	√		√	√
	Efe-4				√	√	√	√	√	√								√	√	√
	Mehmethan GPP	√	√	√				√	√									√	√	√
	Kubilay GPP							√	√	√								√	√	√
	Kerem GPP					√		√	√	√					√			√	√	√
	Maren GPP	√				√		√	√	√	√							√	√	√
	Gumuskoy GPP							√	√									√	√	√
	Melih GPP	√	√	√	√			√	√									√	√	√
	Senkron Efeler BPP								√	√								√	√	√

Projects		VESC's																				
		Settlements (Air Quality Impacts related to H ₂ S – incl. odor)							Global Scale/ Ecosystem Components (GHG Emissions)	Biodiversity	Land Use (Agricultural Land Availability)	Settlements (Visual Impacts/ GPP Facilities)							Settlements (Visual Impacts/ Vapor Plume)	Settlements (Induced Seismicity)	Local Communities and Regional Economy (Services Sector and Employment)	Local Communities (Quality of Life)
		Dagkaraagac	Alangulu	Kizilcagedik	Omerbeyli	Germencik	Sinirteke	Erbeyli				Dagkaraagac	Alangulu	Kizilcagedik	Omerbeyli	Germencik	Sinirteke	Erbeyli				
Reasonably Foreseeable Projects	Kubilay GPP-2								√	√	√								√	√	√	
	3S Kale GPP-1								√	√	√								√	√	√	
Cumulative Impact Potential		Yes (Minor due to very low H ₂ S measurements recorded during monitoring)							Yes (Moderate due to high reservoir GHG content)	Yes (Minor, due to high industrial and agricultural activity in the area, the natural flora and fauna composition has already been degraded to a great extent that no major further impacts are expected)	Yes (Minor, since the impact is limited to power plant and well footprints, which are relatively small compared to other energy generation technologies, and the very limited width of easement corridor for pipelines)	Yes (Negligible, due to the fact that although some GPPs are visible from the same settlements, the distances are far enough)							No (As the Project GPPs will use binary and closed loop systems that reinject the condensed fluids back into the reservoir / no flash systems)	No (Although all identified GPP Projects can hypothetically contribute to induced seismicity, research indicates that this is an issue only for large reservoirs utilized by large number of GPPs - compared to Germencik reservoir-).	Yes (Moderate, since a multitude of energy generation projects, especially GPPs, are already operating and others are being planned, which would all contribute to local economy and employment opportunities for skilled and unskilled personnel from the region.	Yes (Moderate for Gurmat Elektrik GPPs since the Project Company conducts and will continue to conduct various community development activities and programs. Unknown for other GPPs and other power plants.

Source: ESIA Addendum Report, 2018

Management of Cumulative Impacts

In general, existing monitoring data regarding operation of existing Efe GGP Group Projects (Galip Hoca, Efe-1, Efe 2, Efe-3, Efe-4, Efe-6 and Efe-7) indicate that no major impact posed by existing GPPs. However, it should be noted that due to limited literature data and difficulties caused by confidentiality problems of project companies, effectiveness of the CIA assessment is not reached to desired levels. And, long time monitoring data required for reliable assessment. Existing public concerns are also other indicator for cumulative impacts. As given in Section 4.12, public concerns in the region reached to the top level with the increase of GPP investments. In this respect, for the management of cumulative impacts, it is important to underline that the responsibility of the management/mitigation of the cumulative impacts resulting from the actions of multiple stakeholders involves a collective responsibility which requires individual actions to eliminate or minimize the contribution of each action/development. Therefore, managing the potential cumulative impacts is not solely the responsibility of Gürmat Electric. Within this regard, other project owners, related local and national level authorities, NGOs, associations and research institutions should also be involved. With this intention, the MoEU started a cumulative impact assessment study with the support of EBRD. In the study, main aim is to develop a comprehensive and efficient environmental management system for successful geothermal utilization scheme. As Menderes Graben is rapidly developing in terms of geothermal power production capacity, the immediate take of such actions will provide substantial benefit to tackle the future problems related with adverse impacts of geothermal power development. Considering the scale of such a study, participation by a multitude of stakeholders would be required. Gürmat Electric will participate and contribute to such a study.

6. ENVIRONMENTAL AND SOCIAL ACTION PLAN

Table 6-1 Environmental and Social Action Plan

No.	Action	Environmental & Social Risks (Liability/Benefits)	Requirement (Legislative, EBRD PR, GIIP)	Resources, Investment Needs, Responsibility	Timetable	Target and Evaluation Criteria for Successful Implementation	Status/Comment
0	Corporate Requirements						
0.1	Ensure compliance with National Laws and regulations and the EBRD Performance Requirements (2014) – the “PRs”. Inform the lenders on any relevant material regulatory changes, court cases, E&S notifications, E&S incident which adversely affects the Project. Complete additional studies specified and required by any binding decision of the administrative or judiciary authorities for the Project. Update Environmental and Social Instruments according to the completion of any judiciary or administrative process and disclose updated instruments in a timely manner.	Outstanding requirements need to be satisfied to meet Environmental and Social (E&S) assessment standards	EBRD PR1 Relevant Turkish legislation	Own resources, plus external consultants if required	Continuous until the full resolution of any binding legal or administrative proceedings relevant to the Project.	Completion of additional required studies as per any binding legal or administrative proceedings. Full resolution of any outstanding courts’ proceeding. Regular informative note prepared for Lenders every three months in the course of binding legal or administrative proceedings with regards to any relevant material changes in the proceedings. Provision of any additional studies produced by the Borrower in the course of binding legal or administrative proceedings to the Lender immediately upon their completion.	
0.2	The Company shall develop and implement an Environmental and Social Risk Assessment (ESRA) for all new acquisitions /new projects in energy sector. This shall be part of the Company’s corporate management systems in order to avoid and/or address project risks before acquisition/agreeing to undertake new geothermal projects.	To avoid negative public perception on Company as well as Efeler Extension Project. To satisfy banking and environmental and social standards To increase corporate capacity on implementation of Good Industry Practice (as defined under the CTA) for Environmental and Social Management	EBRD Environmental and Social Policy EBRD PR1, Good Industry Practice	Own resources, external consultants, if required	Development of ESRA approach within 6 months of Financial Closure (FC) or before the Company’s acquisition/agreeing to undertake new geothermal projects, whichever is the earliest. Demonstrated adoption of ESRA to new acquisitions /new projects within 12 months from FC (if applicable) or before the Company’s acquisition/agreeing to undertake new geothermal projects, whichever is the earliest. On-going implementation of ESRA to new acquisitions /new projects.	ESRA approach will be submitted to Lenders for review. ESRA implementation reported within the scope of the annual report to the Lenders for all acquisition of similar assets/development of similar projects during the reporting period.	

No.	Action	Environmental & Social Risks (Liability/Benefits)	Requirement (Legislative, EBRD PR, GIIP)	Resources, Investment Needs, Responsibility	Timetable	Target and Evaluation Criteria for Successful Implementation	Status/Comment
PR1	Assessment and Management of Environmental and Social Impacts and Issues						
1.1	Integrate Lenders' requirements (ESAPs, SEPs, and ESMMP) with Company's existing Environmental, Health & Safety (EHS) Management System, and expand into an Environmental, Health & Safety and Social Management System (EHSSMS) to include management of Social aspects. Establish measurable objectives and KPIs for all aspects of EHSSMS in line with the regulatory and Lenders' requirement(s). EHSSMS shall include construction and operation phase management plans/ procedures implemented across all Project facilities. EHSSMS implementation shall be monitored on a regular basis, reported to Company Management and Lender at agreed intervals, and continuously improved.	Continuous challenge in meeting the Lender's requirements contained herein. Optimization of environmental and social management through a formalized system. Implementation of project standards commitments given in the ESA/ESIA Addendums, ESAPs and relevant plans such as ESMMP, SEP etc. Provide resources for training and monitoring of emissions	EBRD PR1 Voluntary and Good Industry Practice	Own resources, plus external consultants if required	Integrate PRs and Good Industry Practice related requirements and commitments (from ESA/ESIA Addendums/ESMMP, ESAPs) into the ESHSMS within 6 months from CTA signing. Demonstrate their integration in Contractors' contracts and their E&S reporting to Company prior to Construction's mid-point. Report for internal purposes only on monthly basis on EHSSMS progress Report on a semi-annual basis to Lenders on implementation of consolidated EHSSMS throughout construction. Report on E&S performance against expanded ESHSMS on a yearly basis throughout operation phase on the agreed Annual E&S Report (AESR) format.	ESAP, SEP, ESMMP and other relevant plans and procedures are included in the EHSSMS and related plans/procedures implemented by Company, and EPC Contractor. EHSSMS implementation progress reported within the scope of the semi-annual E&S Report during construction and AESR to the Lenders.	
1.2	Collaborate with Geothermal Association (JESDER) and other stakeholders for on-going Cumulative Environmental and Social Impact Assessment (CIA) Study which is performed by Ministry of Environment and Urbanization (MoEU) and EBRD, covering the operation of existing and reasonably foreseeable future GPP projects in the region. Implement outputs and mitigations issuing from the CIA that are required by national legislation, through updating the EHSSMS.	Company may be affected by reputational issues and public perception risks extending to the geothermal industry in Turkey. Company can become a sustainability leader in the geothermal industry due to its E&S, technical (and other) performance.	PR1 Good industry practice	Internal or external if needed	2019-2022 for preparation of CIA. On-going implementation of ensuing requirements of national legislation.	Progress reported in the AESR to the Lenders. Company will promote transparency, engagement and disclosure of E&S performance as part of industry-wide initiatives through implantation of PR10	
1.3	Prepare a contractor/sub-contractor management plan referring to Project requirements. Continue implement management measures and conduct monitoring as per the ESMMP.	Non-compliance, incident or accident induced by contractor/sub-contractor may impact the Project's receptors, damage Company's reputation.	EBRD PR1	Own resources, and external consultants if required	Assess Contractor's institutional capacity to implement requirements and commence implementation of required measures for adoption of E&S requirements and commitments by EPC Contractor immediately. EPC Contract to comprise EHSS clauses within 3 m of FC. Continue throughout construction and operation	EHSS requirements integrated to all existing and future contracts. Contractor's reporting to Company on a regular basis on EHSS performance (at least monthly). Results evaluated and reported within the scope of the annual report to the Lenders. Progress reported within the scope of the annual report to the Lenders.	
1.4	Hire and maintain suitable resources to develop and implement the EHSSMS at all time – including a suitably experienced and qualified social specialist.		EBRD PR1	Own resources, and external consultants, if required	Commitment is given to enhance Company's Community Relations' team. Identify and hire relevant specialists by the end of 2019. Continuously engage with stakeholders in a gender and culturally appropriate manner throughout construction and operation	Revision of Organization Chart, Roles & Responsibilities definitions Detailed records of stakeholder engagement activities and representative participations by all stakeholders' groups – in particular women and vulnerable groups.	

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1.5	Seek specialized training on EBRD's sustainability framework, Good Industry Practice and their applicability to the Project to support the integration of the Lenders-driven requirements into the Company's EHSSMS.	Optimization of environmental and social management through training and monitoring.	EBRD PR1	External trainer(s), EBRD's staff to help the Company for the subject training free of charge	In parallel with the development of the integrated EHSSMS (Item 1.1 above).	Training materials and records. Progress reported within the scope of the AESR to the Lenders.	
1.6	Establish a semi-annual (during construction) and annual monitoring schedule and reporting format Report to Lenders on EHSS performance and commitments on a semi-annual basis during construction, and thereafter on an annual basis on the agreed AESR template. Provide information to the Lenders on any material EHSS incidents affecting the Project.	Traceability of progress in implementing E&S requirements. Continuous improvement.	EBRD PR1	Internal resources	Prepare monitoring plan (for the first 3 years) and reporting templates within 6 months from FC.	Monitoring plan/schedule and reporting template(s) to be prepared with the guidance of Lenders. Monitoring and reporting conducted with Good Industry Practice and up to the agreed frequency throughout the course of the Project.	
PR2	Labour and Working Conditions						
2.1	Ensure Human Resources (HR) Policy, employee manual and relevant procedures are developed and include equal opportunity and gender rights provisions as per the applicable standards Ensure the provision of relevant HR documents to all personnel and conduct related training. HR Policy and HR Management System (including internal Grievance Redress Mechanism (GRM)) should cover all Project Workers ²² . The Policy to provide for oversight of contractor policies/ procedures. Consider SA 8000 Certification to formalize the HR management system.	To ensure fair management of workforce in line with EBRD PR2 and related local regulations requirements including prevention of child labor, forced labor, retrenchment principles and encouragement of non-discrimination.	EBRD PR2, Relevant Turkish Regulations	Own resources	Commence implementation immediately Complete HR management system as part of EHSSMS within 6 months from CTA signing (see 1.1 above).	Progress reported within the scope of the AESR to the Lenders.	
2.2.	Ensure all Project Worker's employment contracts comprise wages and overtime payment methods Ensure camp conditions are in line with the IFC-EBRD Workers' Accommodation Guidance Note. Provide workers' accommodation supervision by a medical doctor during construction activities in line with local legal requirements.	To standardize payments provided to Project Workers. To standardize accommodation provided to Project Workers.	EBRD PR2 & Relevant Turkish Regulations	Own resources,	Assess immediately and commence implementation of required measures immediately Continue throughout construction	Progress reported within the scope of AESR to the Lenders	
2.3.	Design and implement a structured Grievance Redress Mechanisms (GRM) for all Project Workers - including mechanism to process anonymous grievances. Train all Project Workers on the use of GRM. Review the appropriateness and effectiveness of the GRM on a regular basis and modify as necessary.	To provide a channel for raising workers concerns and transparent, consistent mechanism for resolution.	EBRD PR2	Own resources, external consultants (if required)	Assess immediately and commence implementation of required measures immediately. Full implementation within 6 months from CTA signing. Continue throughout construction and operation	Grievance mechanism in place and implemented. Universal staff awareness of GRM. Systematic grievance records including responses. Results reported within the scope of the AESR to the Lenders.	

²² Project Workers includes all formal and informal (e.g. day-laborer) employed by Company, contractors and sub-contractors working on the Project.

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2.4.	Develop a security management plan in compliance with the Voluntary Principles on Security and Human Rights. Provide fit-for-purpose Conflict Management and Human Rights Training to the security personnel by qualified trainer (e.g. firm holding an International Code of Conduct (ICoC) certificate).	To eliminate the risk to use of un-proportional force to public. To support the public's positive perception of Company.	EBRD PR2	Own resources and External consultants	Assess immediately and commence implementation of required measures immediately. Complete within 6 months from CTA signing. Continue implementation throughout construction and operation	Security Management Plan in place. Training records. The plan will be provided to the Lenders for their review after completion. Results reported within the scope of the annual report to the Lenders.	
PR3	Resource Efficiency and Pollution Prevention and Control						
3.1.	Implement Environmental and Social Management and Monitoring Plan (ESMMP) (Annex D of ESA Addendum (2019)).	Optimization of environmental and social management through training and monitoring.	EBRD PR1, EBRD PR3	Own resources,	Assess immediately and commence implementation of required measures immediately Continue throughout construction and operation	Monitoring records. Initial reporting on semi-annual basis during construction. Thereafter, results reported within the scope of the AESR to the Lenders.	
3.2.	Monitor closely the GHG measurement results at all operation facilities of the Company. Provide a detailed breakdown of GHG emissions to Lenders as part of the AESR, including an update on the progress of any supplemental measures taken aiming to reduce emissions.	Monitoring of operational impacts associated with GHG Emissions. Aiming to become a model facility in sustainable geothermal power generation by tackling associated GHG emissions	EBRD PR3, Good Industry Practice	Own resources, external consultants (if required)	Continue monitoring at all operational plants. Install monitoring system at Efe-8 and start monitoring when Efe-8 is commissioned.	Monitoring results. GHG emissions and performance of any control measures reported to Lenders within the scope of the AESR.	
3.3.	Continuously evaluate applicable mitigation alternatives to reduce carbon emissions in the medium term and implement technologically and economically feasible alternatives with the aim to operate plant for average carbon emission below the National Grid Emission Factor (GEF) level in the long term.	The Company will develop a GHG reduction program through: - Operational control and re-injection - Carbon capture and storage/ use/ selling to 3 rd party industries - Other feasible techniques	EBRD PR1 EBRD PR3	Own resources	Ongoing evaluation of mitigation measures. Aim to implement trials of feasible technologies within the next 5 years from FC. Roll-out of GHG emission reduction to all Efeler units when technically and economically feasible.	Mitigation alternatives evaluated, and related information reported to Lenders within the scope of the AESR.	
3.4.	Commission an independent review of Best Available Techniques (BAT) for GHG emission reduction and develop a feasibility study to be presented to Lenders on options available.	The study will aim to identify the most technically and economically feasible means to reduce GHG emissions.	EBRD PR3, Good Industry Practice	External consultants and Own resources	Complete detailed BAT/feasibility study within 5 years from FC.	Independent review and feasibility study conducted. Results reported within the scope of AESR.to the Lenders	
3.5.	Continue evaluation of applicable mitigation alternatives to reduce H ₂ S emissions and corresponding odor.	To reduce environmental and health risk of H ₂ S emissions. To reduce the negative public perception mainly triggered by Odor.	EBRD PR3	Own resources, External consultants (if required)	Complete review of available options in 2019 Trial run preferred option for 12 m in 2020. Demonstrate attenuation of negative perception of the Project-related odor emissions through on-going community engagement indicating progress within 36 months following 2020.	Company's reporting on progress with odor impact in AESR. Stakeholder engagement and consultation records	

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PR4	Health and Safety						
4.1	Extend construction phase OHS plans and procedures to Efe-8 Prepare operational phase OHS Plans and Procedures for all Project facilities	Minimize occupational injuries/fatalities due to accidents Optimized health and safety performance.	EBRD PR4 Relevant Turkish legislation Good Industry Practice	Own resources, external consultants (if required)	Complete within 6 months from CTA signing. Continue throughout construction and operation	Occupational H&S Plan in place and implemented Reporting to Lenders included in semi-annual E&S audit report during construction and AESR thereafter.	
4.2	Conduct (or update an existing one for initial units) a comprehensive health and safety risk assessment study (e.g. HAZOP) for the capacity extension GPPs.	Optimized health and safety performance.	EBRD PR4 Relevant Turkish legislation Good Industry Practice	Own resources, external consultants if required (e.g. HAZOP facilitator(s))	Complete study by 31 December 2019. Review H&S risk assessment study and corresponding management measures every 3 years thereafter.	Updated, comprehensive H&S Risk Assessment completed for all units. Record of review of the H&S Risk Management system (procedures, equipment, trainings, etc.) included in every AESR to the Lenders	
4.3	Revise and expand Emergency Response Plan(s) to include Lender's requirements and cover the capacity extension Project. Include various possible scenarios (e.g. pipe rupture and inclusion) covered in the Risk Assessment Study. Engage with relevant institutions such as Fire Department of Germencik and Aydın Province, AFAD. Engage with Community Members to inform relevant stakeholders about Emergency Response Planning and provide training where relevant. Emergency response training to surrounding local villages on ERP, to the extent possible.	Optimized health and safety performance.	EBRD PR4 Relevant Turkish legislation Good Industry Practice	Own resources, external consultants (if required)	Complete updating of ERP documentation and drill schedule within 6 months from FC., no later than 3 months from initial disbursement Conduct drills of all scenarios within 2 years from FC. Thereafter conduct ERP drill (full scale) at least once a year.	Updated Emergency Response Plan, and any other plan/document in place and implemented. Drills schedule and plan. Records and photographic evidence of drills. Records of participation of external stakeholders to drills	
4.4	Conduct semi-annual EHS and labor audits during construction. Within one year of commissioning Efe-8, undertake an independent EHSS audit for the capacity extension (Efe-6, Efe-7 and Efe-8) GPPs against all applicable standards and commitments.	The commissioning and COD reports will review how the capacity extension (Efe-6, Efe-7 and Efe-8) plants have been developed, and whether the ESAP and EIA requirements have been met.	EBRD PR3 National legislation Good Industry Practice	Own resources and External Lenders Independent Environmental and Social Consultant (LIESC)	Semi-annual construction-focused audit during Efe-8 construction from signing of the CTA submitted to the Lenders. Third party EHSS Audit report submitted to Lenders within one year of Efe-8 commissioning, as part of the Commissioning Audit. Yearly AESR reporting to Lenders. 3rd party monitoring report against the applicable standards every five years from CTA signing submitted to Lenders	ToR for LIESC's monitoring audit during post-commissioning audit within 6 months from FC. ToR for five-yearly LIESC's EHSS audit agreed 3 months prior to the audit. Contract with the supplier to be mutually agreed with the Lenders and the Company.	
4.5	Develop a Community Health and Safety Management Plan to be supported by the OHS and medical experts of the company and the Public Health experts (if required) Respond to community's concerns on the Project's impact to public health through effective implementation and stakeholder engagement process.	Address concerns expressed in multiple forums by Project Affected People and external stakeholders toward geothermal industry in general and the Project in particular.	EBRD PR4 Relevant Turkish legislation Good Industry Practice	Own Resources Public Health experts (if required)	Develop Community Health and safety Management Plan by end 4Q 2019 Start study immediately Initial report in first AESR, and yearly thereafter. Continue throughout construction and operation	Community Health & Safety Management Plan in place. Records of all activities conducted as part of the Community Health and Safety Management Plan Summary of the activities reported to the Lenders as part of AESR.	

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4.6	Implement training activities to reduce exposure to infectious diseases (such as HIV, hepatitis and Legionella) for communities and workers.	Reduced impact of infectious diseases.	EBRD PR4 Relevant Turkish legislation Good Industry Practice	Own resources, appropriate local institutions as/when required.	- Commence implementation immediately after completion of the OHS and the Community Health and Safety Management Plans - Conduct regular health checks to employees internally by the Company doctor - Provide training to employees at least on annual basis and; - Provide at least one external training in selected communities per year. Report on training activities – including overview of training material, training frequency and attendance – on an annual basis in AESR.	Records of training activities will be reported in AESR to the Lenders	
PR5	Land Acquisition, Involuntary Resettlement and Economic Displacement						
5.1	Develop a Land Acquisition (covering acquisition and leasing/rental) procedure in line with local administrative requirements and Lenders' PR5 requirements.	Systematic approach to land acquisition and management of impacts on livelihoods	EBRD PR1, EBRD PR5, Good Industry Practice	Own resources, external consultants (if required)	Prior to securing (acquisition, lease, rental) of any land for the Project (e.g. Efe-8 pipeline's Right-of-Way)	Land Acquisition Procedures submitted to Lenders prior to any land acquisition (including leasing, renting, etc.) Implementation records provided with AESR for reporting period	
5.2.	Use its best efforts to monitor the land acquisition process carried out by TEİAŞ for high voltage transmission lines against national legislation. Extend Grievance Redress Mechanism (GRM) to all land-acquisition related activities.	To avoid negative social impact posed by associated facilities.	EBRD PR1, EBRD PR5, National legislation Good I Industry Practice	Own resources,	Commence implementation immediately Continue throughout construction and operation	Resolution of the concerns on best effort basis. Details on all temporary and permanent land acquisition details that occurred during the reporting period – comprising an assessment of alignment with PR5 - included in the AESR submitted to Lenders	
5.3	Monitoring operational impacts on agricultural production such as olives and fig in cooperation with Provincial/District Directorate of Agriculture and/or Chamber of Agricultural Engineers or similar recognized professional or academical parties.	To avoid negative social impact posed by projects. To increase positive public perception on the Company.	EBRD PR1, EBRD PR5	Own resources, external consultants if required.	Commence implementation immediately Continue throughout construction and operation	Monitoring reports. Compensations records.	
PR8	Cultural Heritage						
8.1	Chance finds shall be handled in line with related national legislation and relevant authorities are informed in case of a chance find.	Any archaeological finds will be preserved during the construction process	EBRD PR8	Own resources	Commence implementation immediately – no later than 3 months after CTA signing or prior to start of construction on associated facilities such as pipelines, transmission line(s), etc., whichever comes the earliest. Continue throughout construction	Chance Finds Procedure adopted. All staff, including EPC Contractor, trained in implementation	

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PR10	Information Disclosure and Stakeholder Engagement						
10.1	Implement the SEP and the grievance mechanism. As part of the SEP, maintain a register of external communications including minutes of meetings held with stakeholders. Review SEP on an ongoing basis and update as necessary.	To maintain good stakeholder engagement and framework for sharing information with the public	EBRD PR10 Good industry Practice	Own resources	Commence implementation immediately Continue throughout construction and operation Report on SEP implementation and updates on an annual basis in AESR.	Information on material grievances received and how these are addressed/ resolved provided to Lenders as part of the AESR.	
10.2	ESA, SEP, NTS and ESAP to be disclosed locally and on web site until the end of the third year from the COD of Efe-8. Implement the requirements of the Lenders ESIA disclosure package and National legislation. Provide an update on the implementation of the SEP and ESAP in annual external E&S performance disclosure.	The Lender ESIA disclosure document contains information on the project design and implementation as well as compliance. This will be used to benchmark the plants EHSS performance	ERBD PR 10	Internal,	Retain E&S documentation on Company's website at least until the end of the third year from the COD of Efe-8. Publish a summary of SEP and ESAP implementation on Company website on an annual basis, no later than for 2020 reporting year.	Documents available locally and on Company's web site Publication of external E&S performance summary for reporting year 2020 no later than 90 days after reporting period, and annually.	
10.3	Conduct external reporting to public, summarizing project progress, EHSS performance, GHG emissions, CSR (Corporate Social Responsibility) activities and other relevant information. Provide full data to Lenders on H2S and GHG emission on annual basis.	To maintain good stakeholder engagement, implement Good industry practice, disclose annual non-financial information.	EBRD PR 3 EBRD PR 10 Good industry Practice	Internal	Preparation of disclosure template within 6 months from FC. Annual disclosure on Company website, within [90] days after year end for the duration of the Loan .	Sharing of disclosure template with Lenders. EHSS performance information, GHG emissions, CSR information to be disclosed in summary form on the web-site of the Company. H2S and GHG emission data to be reported within AESR to Lenders.	
10.4	Continue to implement community development projects which aim to support education and enhance agricultural production in the villages in line with the needs of the communities.	To avoid negative social impact posed by projects. To increase positive public perception on Gurmat.	EBRD PR1, EBRD PR10	Own resources, and other donor funds (if possible) to be organized by Lenders.	Annual Community Development Plans Commence implementation immediately Continue throughout construction and operation	Report in AESR.	
10.5	Use its best efforts to increase gender diversity and representativeness of the Community Relations function within Gurmat. Engage and consult in a gender and culturally appropriate manner, in particular ensuring the inclusion of women stakeholders.		EBRD PR1	Own resources, and external consultants if required	Continuously engage with stakeholders in a gender and culturally appropriate manner throughout construction and operation	Detailed records of stakeholder engagement activities and representative participations by all stakeholders' groups – in particular women and vulnerable groups (if any) included in AESR	
10.6	Establish Participatory Community Based Monitoring Committee (PCBMC) with the representatives of the affected villages and conduct periodic meetings with PCBMC to discuss the project issues including environmental & social monitoring results.	To allow systematic information disclosure to the communities on regular basis To help to build the trust to the company and address controversial issues such as human health and impact on livelihoods etc.	EBRD PR 10 Best Practice	Internal	Quarterly	Meeting notes.	