
EFELER GEOTHERMAL POWER PLANT (GPP) PROJECT

NON-TECHNICAL SUMMARY



May 2019

ANKARA

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LIST OF ACRONYMS

AR5	IPCC Assessment Report 5
CH	Critical Habitat
CIA	Cumulative Impact Assessment
CSR	Corporate Social Responsibility
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EMRA	Energy Market Regulatory Authority
ESAP	Environmental and Social Action Plan
ESP	Environmental and Social Policy
ESA	Environmental and Social Assessment
ESIA	Environmental and Social Impact Assessment
ESMAP	Energy Sector Management Assistance Program
EU	European Union
ETL	Energy Transmission Line
GEA	Geothermal Energy Association
GHG	Greenhouse Gas
GIIP	Good International Industrial Practice
GPP	Geothermal Power Plant
GWP	Global Warming Potential
HR	Human Resources
IAIA	International Association for Impact Assessment
IAPCR	Industrial Air Pollution Control Regulation
IUCN	International Union for Conservation of Nature
IBA	Important Bird Area
IPA	Important Plant Area
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
KBA	Key Biodiversity Area
MoEU	Ministry of Environment and Urbanization
NCG	Non-condensable Gas
NTS	Non-technical Summary
OHS	Occupational Health and Safety
PAP	Project Affected People
PR	Performance Requirement
RAMEN	Regulation on Management and Assessment of Environmental Noise
REN21	the Renewable Energy Policy Network for the 21st Century
SEP	Stakeholder Engagement Plan
SLIP	Supplementary Lenders Information Package
SSC	Species Survival Commission

VESC	Valuable Ecosystem Component
WBCD	World Business Council for Sustainable Development
WRI	World Resource Institute
WWF	World Wide Fund for Nature
WWTP	Wastewater Treatment Plant

1. INTRODUCTION

Guris Insaat ve Muhendislik A.S. (“Guris”) was established in 1958 as Guris Kolektif and has been conducting its activities in construction, industry, energy, tourism and mining sectors. Mogan Enerji Yatirim Holding A. S. (“Mogan”), Guris’ affiliate for energy developments, aims to become a leading energy generation company in Turkey through renewable energy projects. In line with this goal, Mogan is currently operating multiple geothermal power plants (GPPs), wind power plants and hydroelectric power plants, and a multitude of other Mogan renewable energy projects are either under construction or in development. Mogan’s geothermal energy developments are executed by Gurmat Electric Uretim A.S. (“Gurmat Electric” or “the Project Company”), which was established in 1999. It is currently operating large and productive GPP in Turkey, referred to as Gurmat-2 GPP, in Germencik district of Aydin province.

Gurmat Electric is planning to construct and operate the Efeler Geothermal Power Plant Capacity Extension Project (the “Extension Project of the Efeler GPP Project” or the “Project”) of the existing Gurmat-2 GPPs. The existing Gurmat-2 GPPs in operation are Efe-1, Efe-2, Efe-3 and Efe-4 GPPs, whereas the Project under consideration for financing by 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”) (together “the Lenders”) consists of Efe-6, Efe-7 and Efe-8 GPPs, of which Efe-6 GPP is in operation since August 2017, Efe-7 GPP is in operation since October 2018 and Efe-8 GPP construction was initiated in 2018. The construction works for Efe-8 GPP have been temporarily suspended by Gurmat with its own initiative decision between September 2017 and December 2018 due to legal proceedings against the EIA approval initiated by the Aydin Environment and Nature Association (Aydın Çevre ve Doğa Derneği). The relevant EIA approval was reinstated by 14th Division of the Republic of Turkey Presidency of the Council of State dated December 27, 2018 (Docket No. 2018/5091 Decision No. 2018/8330).

Gurmat is addressing the concerns raised in the course of the legal proceedings through additional studies, summarized in this disclosed Non-Technical Summary (“NTS”) and other components of the 2019 Disclosure Package, comprising an updated Environmental and Social Assessment (“ESA”), an Environmental and Social Management and Monitoring Plan (“ESMMP”), a Stakeholder Engagement Plan (“SEP”) and an Environmental and Social Action Plan (“ESAP”) comprising legally binding environmental and social commitments of the Company. In parallel the Company is pursuing closure of all legal proceedings regarding Efe-8 GPP’s EIA permitting as explained in Section 2 below.

The Lenders are considering providing a loan to Gurmat Electric for the Project. The EBRD has financed the development of the existing Gurmat 1 (also known as Galip Hoca), Gurmat-2 (Efe-1, Efe-2, Efe-3, Efe-4) GPPs for which a separate Environmental Impact Assessment (EIA) Addendum and Social Impact Assessment (SIA) Reports were developed in 2014 by

WS Atkins International Ltd and disclosed on the EBRD's and the Project Company's websites¹.

Due to the scale and cumulative impacts of the Efeler GPP Capacity Extension Project, it was categorized as Category A according to the EBRD Environmental and Social Policy (2014), which is also adopted by the other members of the Lenders' group for the purpose of appraising and monitoring the Project. The Company commissioned AECOM Turkey Danışmanlık ve Mühendislik Ltd. Şti. ("AECOM") in 2017 to develop additional supplementary environmental and social studies to meet the EBRD PRs and international good practice for the Efeler GPP Capacity Extension Project, following a review of the regulatory EIA Reports prepared to meet the national requirements for Efe-6, Efe-7 and Efe-8 GPPs. The corresponding Environmental and Social Impact Assessment (ESIA) Addendum – including an Environmental and Social Management Plan (ESMP), Stakeholder Engagement Plan (SEP) and Non-Technical Summary (NTS), were prepared and disclosed in 2018¹ (the "2018 Disclosure Package").

2U1K Mühendislik ve Danışmanlık A.Ş. ("2U1K" or "the Consultant") has been engaged by the Company to address the concerns expressed by stakeholders and raised in the course of the legal proceedings in late 2018 and early 2019 by carrying out a further Environmental and Social Assessment (ESA), including a gap analysis of the previous and current environmental and social documentation relevant to the Project against the EBRD requirements, and reflect the additional studies conducted by Guris since the 2018 Disclosure Package (this "Assignment"). In line with the EBRD's Environmental and Social Policy (2014), which is also adopted by the other members of the Lenders' group for the purpose of appraising and monitoring the Project, 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 (PRs). This includes, for the initial phase of the Project (Efe-1, Efe-2, Efe-3, and Efe-4 GPPs), and construction/operation of the Expansion 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.

The results of the gap analysis indicate that there are no major environmental and social gaps identified in terms of Environmental and Social Impact Assessment process with respect to EBRD's PRs. On the other hand, some improvement areas are identified as the implementation of the requirements. These are given below:

- Improvement of the Environmental and Social Management Systems of the Project Company,
 - Development and implementation of an Environmental and Social Risk Assessment (ESRA) by the Project Company for all new acquisitions /new projects in line with the Environmental and Social Action Plan (ESAP) in order to avoid and/or address project risks.

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>

- Development of a Quality Policy as well as a Social Policy covering i) HR policy; ii) corporate social responsibility; iii) stakeholder engagement; iv) livelihood restoration; and v) human rights.
- Integration of Lenders' requirements 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. EHSSMS will include construction and operation phase management plans/ procedures implemented across all Project facilities.
- Monitoring of EHSSMS implementation on a regular basis, reporting to Company Management and Lender at agreed intervals, and sustaining continuous improvement.
- 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 academic parties.
- Identification of the opportunities and alternatives for resource efficiency relating to the Project in accordance with the good international practice (GIP).
- Preparation of a Subcontractor Management Plan.
- Enhancement of the Environmental and OHS Policies of the Project Company,
 - Revision of the existing OHS plans and procedures.
 - Improvement of existing Worker Grievance Mechanism including anonymous grievances for all workers including subcontractors.
 - Establishment of a documented Health and Safety Management System integrating the health and safety plans and procedures, employee training, awareness, and reporting elements.
 - Establishment of an Incident/Accident Investigation Procedure including clearly defined roles and responsibilities.
 - Establishment of a Risk Assessment Procedure that 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.
 - Evaluation of the workplaces in terms of personal exposure levels and conditions based on the identification and evaluation to be made in the risk assessment studies.
 - Establishment of a Security Management Plan in compliance with the United Nations Voluntary Principles.
- Update of the existing Stakeholder Engagement Plan according to the Project's needs, and Improvement of the grievance mechanism for public concerns,
- Preparation of a Land Acquisition Policy and Procedure,

- Establishment of a Chance Find Procedure for use, particularly during the piping works as part of the Efe-8 GPP, and for managing consultations with affected communities and other stakeholders.

The findings of the study are agreed with Gürmat and detailed as an Environmental and Social Action Plan (ESAP) format. The ESAP is disclosed together with other updated documents such as NTS, ESA and SEP.

2. PROJECT DESCRIPTION

In line with the Strategic Plan (2015-2019) of the Ministry of Energy and Natural Resources aiming to encourage use of renewable energy potential in Turkish economy and the Turkish Energy Policy, the Efeler GPP Project generates power by utilizing the Germencik geothermal field waters. Located to the western part of the Buyuk Menderes Graben, which is a region of abundant geothermal activity, the Germencik field is one of the two hottest geothermal systems in Turkey. Accordingly, several geothermal power plants have been constructed by multiple developers over the last three decades in the Menderes Graben to harness the substantial geothermal potential of the area.

At the Project location, Gurmat Electric has been operating the existing Gurmat-1 GPP (also called Galip Hoca GPP) since 2009 and Gurmat-2 GPP since 2014, and recently commissioned 47.6 MWe out of 97.6 MWe of the Gurmat-2 Capacity Expansion.

Other GPP operating or being developed in separate concession areas are presented in the cumulative assessment section of the NTS.

The Efeler GPP Capacity Expansion Project, with an installed capacity of 97.6 MWe, aims to increase the existing total operating capacities of Gurmat-2 GPPs from 114.9 MWe to 212.5 MWe. Installed capacities, energy generation technologies and current status for Gurmat-1, Gurmat-2 and the Project GPPs are shown below in Figure 2-1.

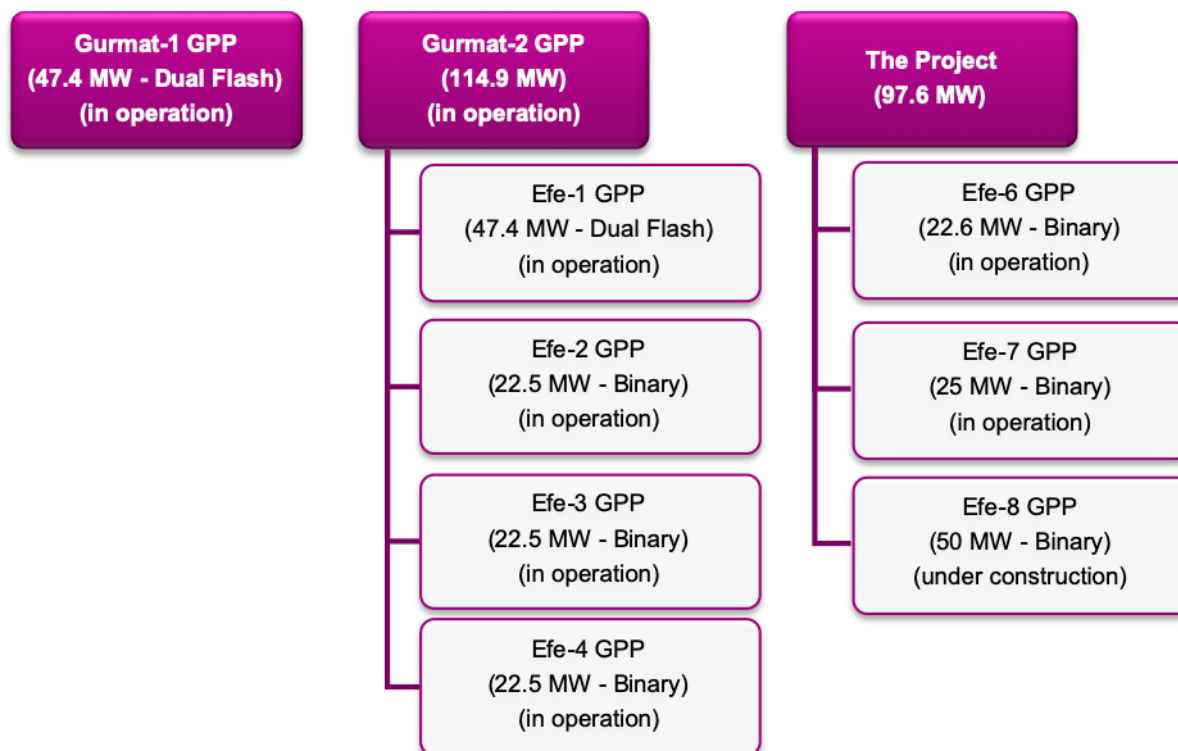


Figure 2-1 Installed Capacities, Energy Generation Technologies and Current Status of Gurmat-1, Gurmat-2 and the Project GPPs

2.1 Project Background

Currently, Gurmat-1, Gurmat-2 GPP and Efe-6 and Efe-7 units of Efeler GPP Capacity Extension Projects are in operation. With this intention, 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. Additionally, License for Efe-8 GPP (2019) have also been obtained.

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 Aydin in consequence of the request of Aydin Environment and Nature Association (Aydin Çevre ve Doğa Derneği). However, the recent decision of the 14th Division of the Republic of Turkey Presidency of the Council of State dated December 27, 2018 (Docket No. 2018/5091 Decision No. 2018/8330) ends the decision of the 2nd Administrative Court of Aydin relating to cancellation of the approval for the EIA Report. 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. Therefore, the EIA Approval of the Ministry of Environment and Urbanization is effective, and therefore, Gurmat Electric can start construction. On the other hand, the dispute will be reconsidered by the 2nd Administrative Court of Aydin and a new verdict must be rendered based on the recent decision of the Council of State. Gurmat and Lenders agreed that all necessary studies and/or analysis will be performed in accordance to new decision of 2nd Administrative Court of Aydin and Gurmat will implement the results of new decision and remain in compliance with the applicable regulatory requirements at all time. See Section 3.12 below for further details.

The key milestones for Gurmat-1, Gurmat-2 and the Project GPPs utilizing the Germencik Geothermal Field are provided below in Figure 2-2.

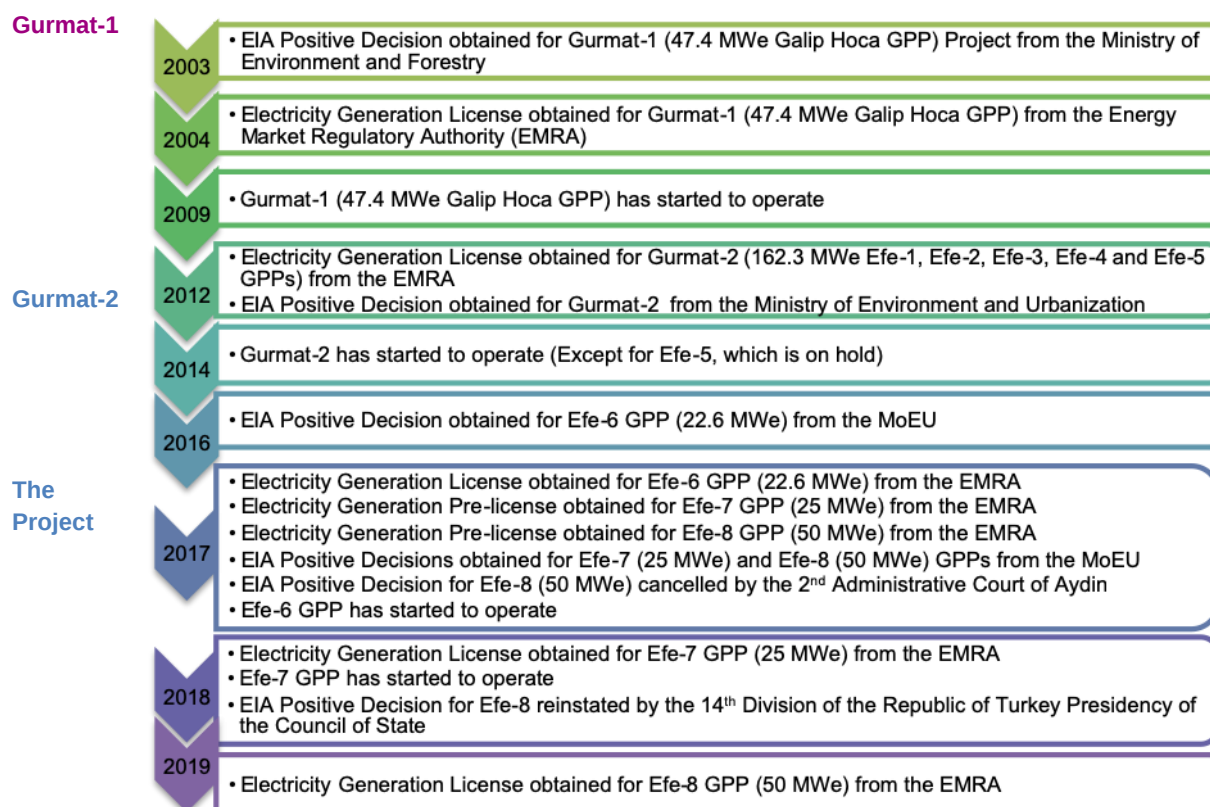


Figure 2-2 Key Milestones for Gurmat-1, Gurmat-2 and the Project GPPs

2.2 Project Location

The Project area is located near Omerbeyli Neighborhood of Germencik District in Aydin Province. A map showing the existing and Project GPPs is provided below in Figure 2-3. As can be seen, Efe-6 GPP is located adjacent to Gurmat-1 GPP; Efe-7 GPP is located adjacent to Efe-2 GPP; and Efe-8 GPP is located adjacent to Efe-1, Efe-3 and Efe-4 GPPs.

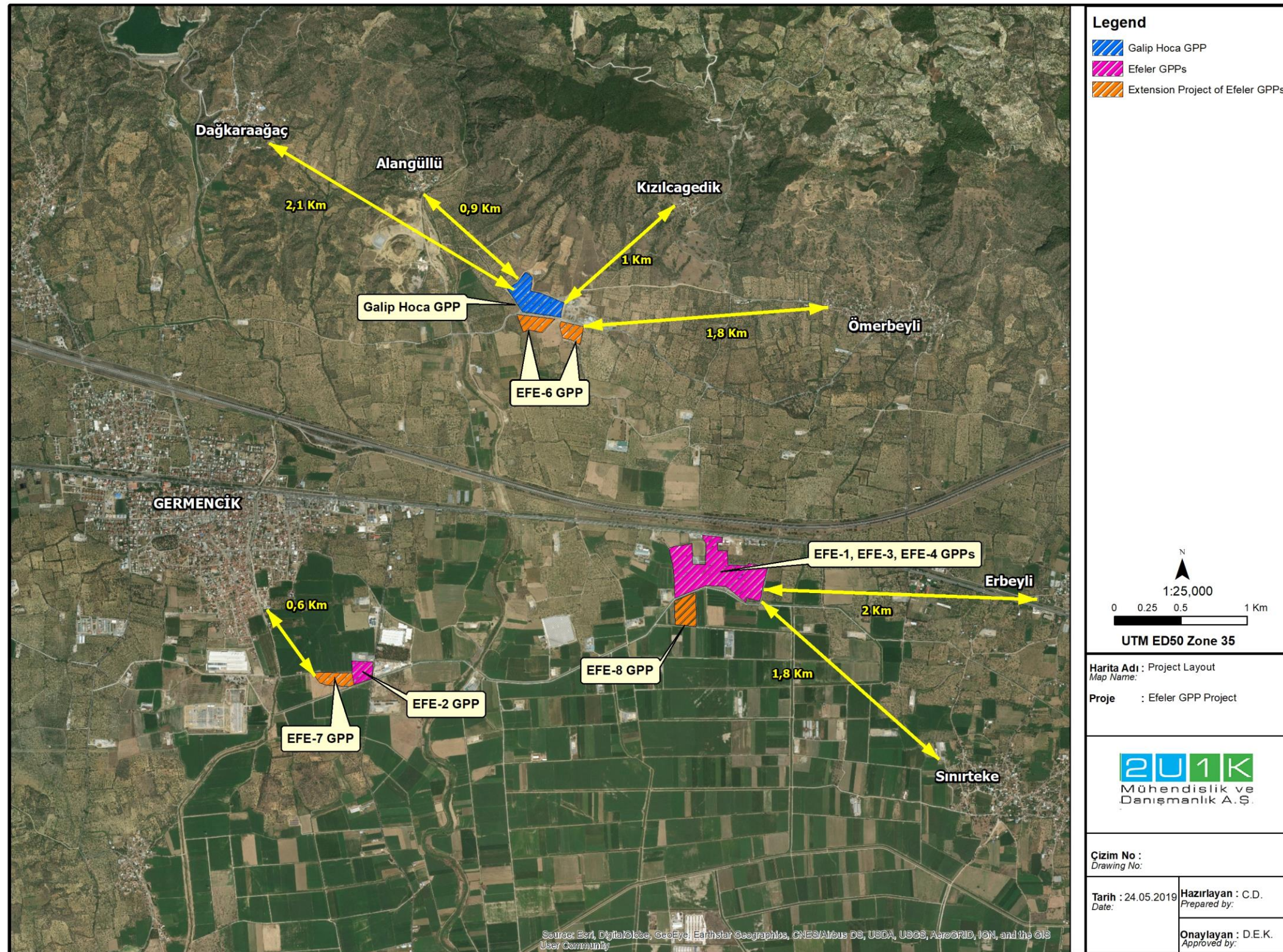
All land acquisition processes for the Project GPPs are completed and title deeds/ right of way title deeds are obtained. Land acquisition was based on willingness and no expropriation or physical displacement occurred. Distances of Efe-6, Efe-7 and Efe-8 GPPs to the nearby settlements are provided in Table 2-1 given below.

Table 2-1 Distances of the Project GPPs to the Nearby Settlements

Distances (km) of the Project GPPs to the Nearby Settlements			
Settlements	Distance (km)		
	Efe-6 GPP	Efe-7 GPP	Efe-8 GPP
Aydin City Center	19	20	18
Germencik District Center	3	1.6	3.7
Incirliova District Center	7.8	10.5	9
Omerbeyli Neighborhood	2.3	5	2.5
Kizilcagedik Neighborhood	1.9	4.5	3

Distances (km) of the Project GPPs to the Nearby Settlements			
Settlements	Distance (km)		
	Efe-6 GPP	Efe-7 GPP	Efe-8 GPP
Alangullu Neighborhood	1.5	3.8	3.7
Turanlar Neighborhood	5.5	2.9	3.9
Sinirteke Neighborhood	5	5.5	3
Erbeyli Neighborhood	4.2	5.8	3
Akcesme Neighborhood	3.6	6.3	3.8

Figure 2-3 Map of the Locations of the Project GPPs in addition to the Existing Gurmat-1 and Gurmat-2 GPPs



2.3 Project Characteristics

Within the scope of the Project, the 22.6 MWe Efe-6 GPP is projected to generate an annual 180.8 GWh electricity, the 25 MWe Efe-7 GPP is projected to generate an annual 200 GWh electricity and the 50 MWe Efe-8 GPP is projected to generate an annual 400 GWh electricity.

Project Components

The Project includes the construction and operation of the main components and associated facilities provided in Figure 2-4 below. The GPP technology and the energy generation process are further detailed in the following section.

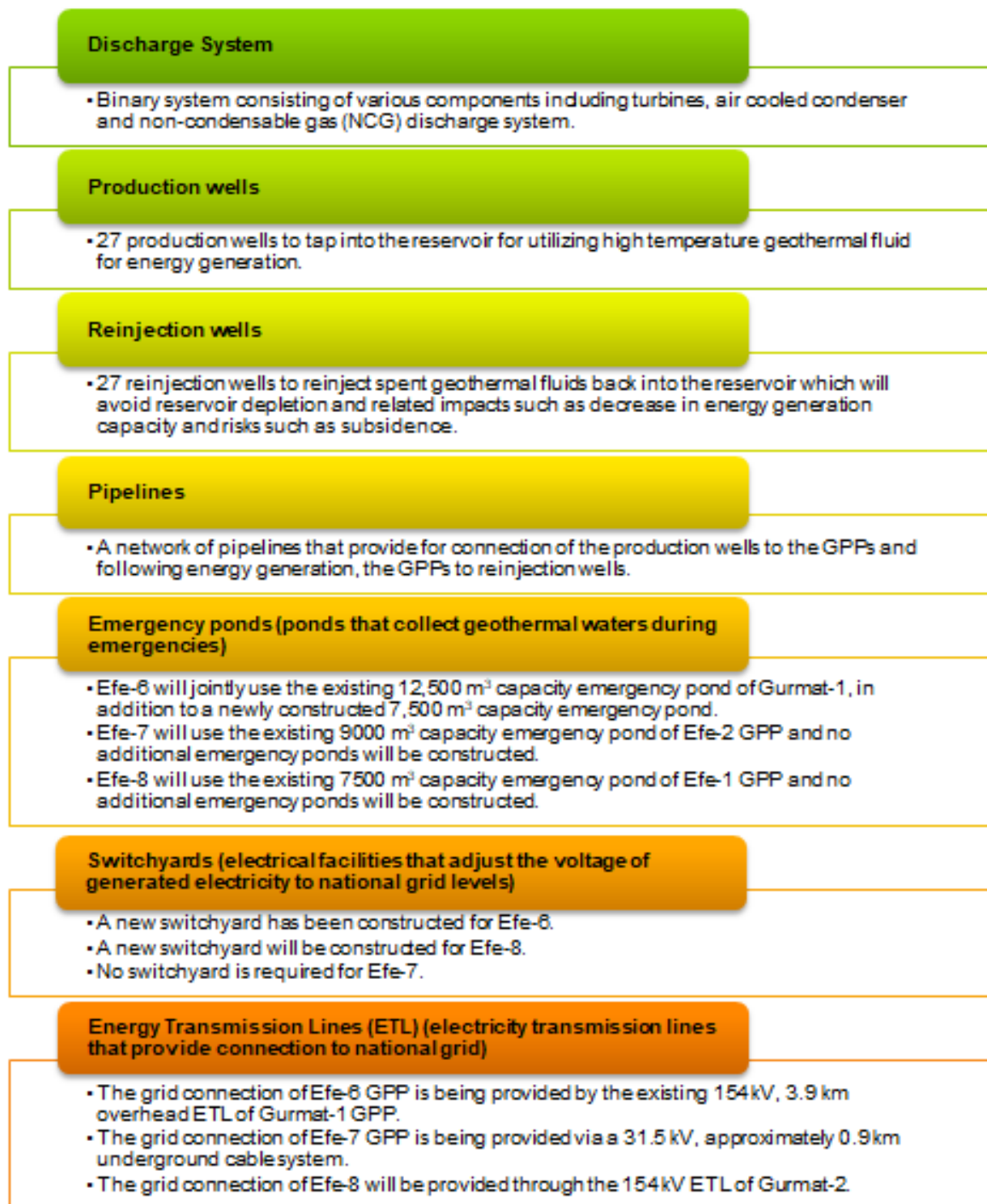
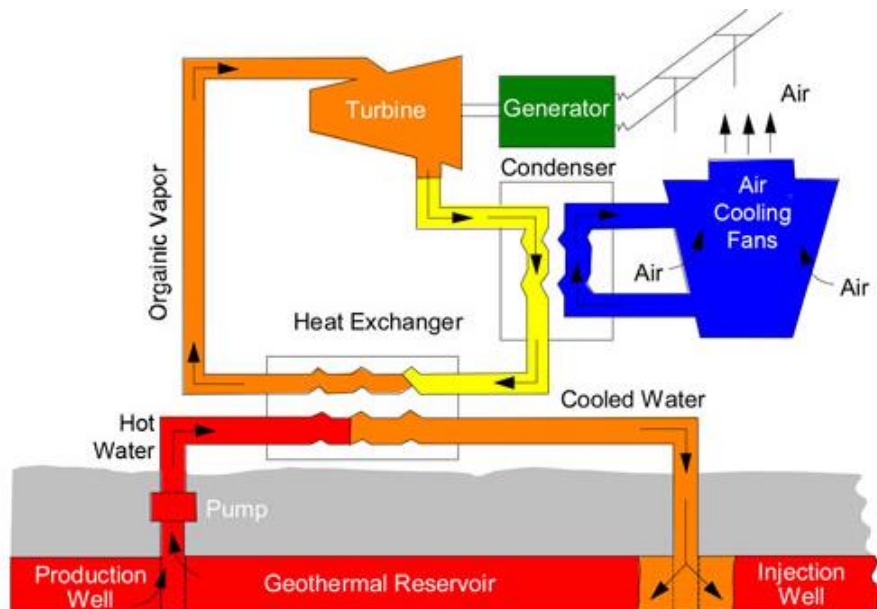


Figure 2-4 Main Components of the Project and its Associated Facilities

Description of Selected Technology and the Energy Generation Process

There are five different types of geothermal power plants: binary, single flash, double flash, back pressure and dry steam. At the utility scale, conventional steam turbines (single or double flash plants) and binary plants are used to generate electricity, with final technology selection based mainly on geothermal fluid temperature and reservoir conditions. Therefore, a detailed evaluation of the data produced from test wells is fundamental for specification of the process technology and plant design, including production and reinjection wells' locations and the pipeline routes.

Based on exploration phase studies, existing data of currently operational GPPs and further feasibility studies considering the estimated enthalpy, chemical characteristics and capacity of the resource, binary system has been selected as the most feasible alternative for all Project units. A simplified flow diagram for single-phase (pumped) binary process is presented below in Figure 2-5. In the binary process, a secondary working fluid is utilized. First, the geothermal fluid coming from the production wells is separated to steam and liquid phases. Afterwards, geothermal fluid is diverted to the evaporators to convert the pre-heated secondary fluid (n-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. Pentane coming out of the turbines in the form of exhaust steam is sent to the heat exchangers. Pentane passes through the heat exchangers as separate liquid and steam forms. Pentane in steam form transfers some of its heat to the liquid form and then lead to the cooling tower for condensation.



Source: Colorado Geological Survey website

Figure 2-5 Simplified Flow Diagram for Single-Phase (Pumped) Binary Process

The advantages and drawbacks of the single-phase (pumped) binary process are summarized below in Figure 2-6.

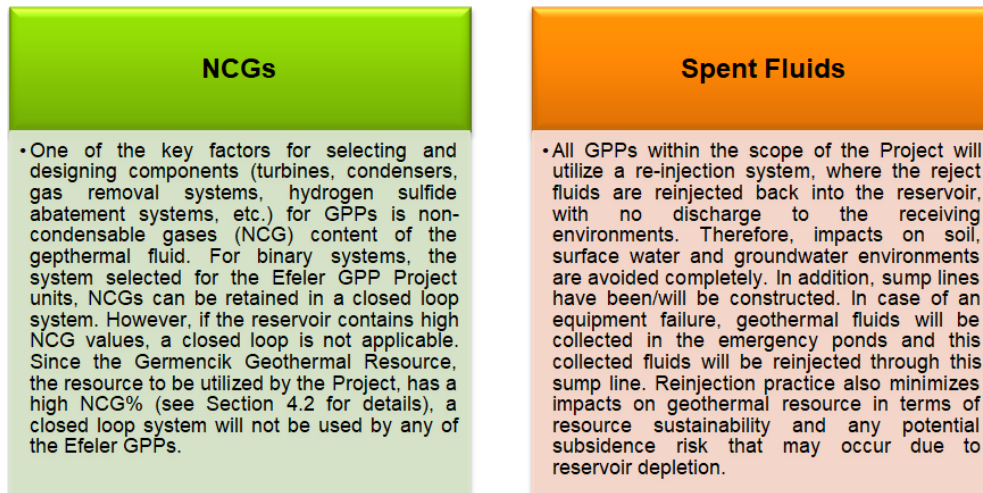


Figure 2-6 Summary of the Advantages and Drawbacks of the Single-Phase (Pumped) Binary Process

3. COMPLIANCE WITH EBRD PERFORMANCE REQUIREMENTS

This section of the NTS summarizes the findings of the ESA studies conducted to identify the Project's and existing Gurmat Electric GPPs' compliance with the EBRD Performance Requirements (PRs) and describes the potential environmental and social impacts and how these impacts will be managed at the Project level.

3.1 Air Quality

Geothermal fluids naturally contain gases, which are known as geothermal gases. Geothermal gases are dissolved in the liquid phase at the reservoir level. They 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 gaseous phase. NCGs have a negative effect on the efficiency of the energy conversion process and need to be removed from the system. In this respect, potential adverse impacts of the emissions of the NCGs, (H_2S and CO_2), generated by the Extension Project of the Efeler GPP Project are assessed in EIA process. The assessment results show that all of the calculated air emission values are below the limit values provided by the Industrial Air Pollution Control Regulation (IAPCR). The details of the assessments are summarized in the paragraphs given below:

H₂S Emissions

15 monitoring stations for H_2S emissions have been set up and continue to be maintained at locations in or near the neighbourhoods of Alangullu, Kizilcagedik, Omerbeyli and the District of Germencik. Monitoring of H_2S emissions is being conducted since February 2017 at these locations, which are selected to represent the ambient air conditions at the nearby settlements. According to the monitoring results of the period from February 2017 to July 2018, the measurements range between 0.01 - 0.30 $\mu g/m^3$, which are significantly below the 24-hour limit value of 20 $\mu g/m^3$ and 1-hour limit value of 100 $\mu g/m^3$ defined in the national Industrial Air Pollution Control Regulation (IAPCR) in addition to readily fulfilling the 24-hour limit value of 150 $\mu g/m^3$ established by WHO. The measurement results even comply with the 30-min average ambient air H_2S concentration of 7 $\mu g/m^3$ recommended by WHO to avoid odor annoyance.

Despite the fact that the measurement results of H_2S at 15 measurement points are well below the national and international limit values and therefore, the ambient concentrations of H_2S 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 H_2S emissions from the Gurmat-1, Gurmat-2 and the Extension Project of the Efeler GPPs. Gurmat Electric is putting efforts in addressing the concerns and complaints of the local communities. In this regard, odor removal system will be installed at the outlets of the power plants in order to minimize the H_2S emissions.

CO₂ Emissions

The geothermal resources utilized/to be utilized by the Project are located in the Germencik Field of the northern Menderes Graben in the western Turkey, which is known to have the highest reported GHG emission values in the world (900 to 1,300 g CO₂/kWh) from the geothermal power plants located therein (The International Bank for Reconstruction and Development, 2016). 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.

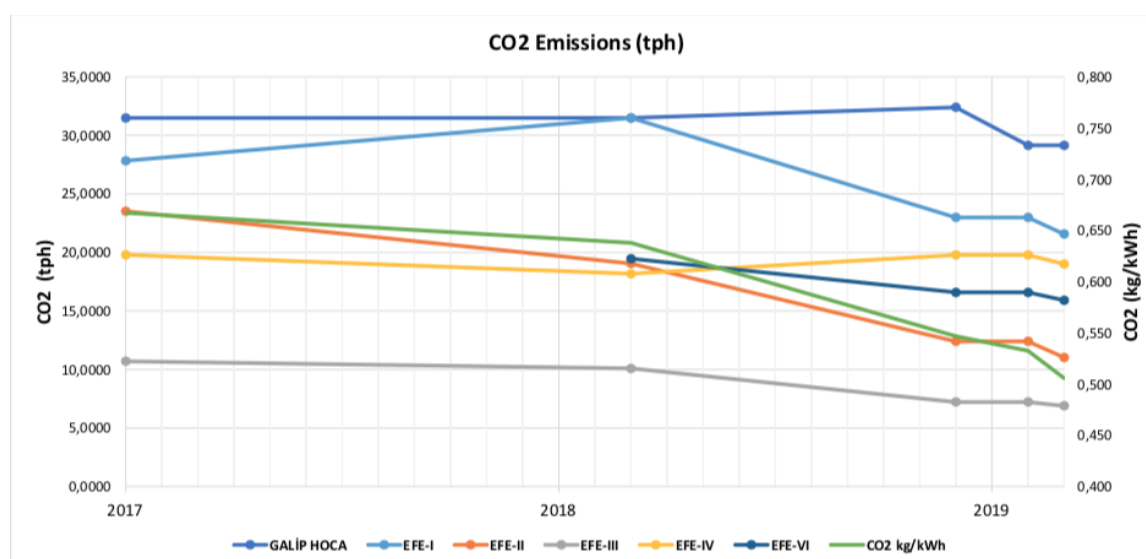
It is important to identify the potential GHG emissions resulting from the Project, together with the existing Gürmat Electric GPPs utilizing the same reservoir.

The non-condensable gases (NCGs) analyses were 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 accredited laboratories. Through use of the NCG ratios, which are measured by a chemist on a regular basis, the emission rates of CO₂ were calculated and monitored for January 2017, March 2018 and March 2019. 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 as can be seen in Table 3-1 and Figure 3-1 below.

Table 3-1 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: ESA Report, 2019



Source: ESA Report, 2019

Figure 3-1 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

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 3-1) and the annual operating hours provided by the Project Company for 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 3-2. 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 calculated according to the NCG values projected in

their national EIA Reports are utilized along with the estimated annual operating time of 8,000 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 3-2 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 ^g (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 ^g (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 (as given in Table 3-1) 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.

^g: 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 3-2 above. In Table 3-3 given below, the estimation is made including the SF₆ emissions.

Table 3-3 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

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 International Bank for Reconstruction and Development, 2016).

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 (EBRD, 2015). As indicated in bold in Table 3-1 above, the average amount of CO₂ emissions is calculated as 0.506 t CO₂/MWh 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, 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.

Further Considerations on CO₂ Emission Reduction

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 Veizade, Geologica and Leidos, 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 Gürmat-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 3-4 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 the modeling studies.

Table 3-4 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 3-2 above.

^b: The values are taken from Table 3-2 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

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°C².

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, Gurmat Electric conducts studies of various methods of CO₂ capture including full reinjection to make “zero-emission” possible.

3.2 Water Quality

According to the results of impact assessment process, no major impact is expected on water quality. Assessments on water quality and related mitigation measures already implemented by Gurmat at Efeler Projects are the followings;

- Utility water and potable water is supplied by purchasing and no groundwater or surface water resource will be used during construction and operation phases. Therefore, there will be no on-site impact on water availability.

² https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Turkey/1/The_INDC_of_TURKEY_v.15.19.30.pdf

- There are no natural river drainage patterns in the vicinity of capacity extension project since groundwater and surface water are controlled by drainage and irrigation channels. Pipeline routes for all Project GPPs were designed to ensure these channels are not impacted by the Project activities.
- Units of the Extension Project utilize air-cooled condenser systems, whereas a closed water-cooled system will only be used for cooling of turbines and generators. Therefore, operation phase water requirement is kept to a minimum, consisting mainly of domestic water requirement for personnel.
- The production and reinjection wells drilled/to be drilled utilize leak proof well casings and blowout prevention equipment, which prevents interaction of geothermal water and shallow groundwater³.
- Following the completion of drilling, some test studies are conducted for determination of physical and chemical characteristics of the geothermal waters. If found to be suitable, the collected geothermal waters are moved to the geothermal fluid storage ponds that are already in place. The geothermal fluids collected in these ponds are later reinjected back in to the reservoir. In case this option is not possible, the geothermal fluids collected in the mud pools (i.e. not the geothermal fluid ponds but the impermeable ponds located in well sites) will only be discharged to receiving environments once related tests are conducted by licensed laboratories and compliance with discharge limits set by Water Pollution Control Regulation is ensured. Required treatment will be implemented prior to discharge in case the test results indicate that the tested parameters are not in compliance with the Regulation.
- The wells have/will have leak-proof features (double casings and cementing between these casings) to prevent interaction between the geothermal fluid and the intersected groundwater tables through double casings, as well as to prevent the wells becoming a conduit for connectivity between the different groundwater tables through cementing.
- 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 ponds to be constructed for Extension Project will be utilized. In addition, all generation activities will be halted 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 reinjected back into the reservoir through sump pumps. Efe-6 GPP will jointly use the existing 12,500 m³ capacity emergency pond of Gurmat-1 for reinjection related emergencies. In addition, a separate 7,500 m³ capacity

³ As indicated in the Hydrogeological Investigation Report dated February 2019 specifically prepared for the Efe-8 GPP Project, the Hydrogeological Survey Report of the State Hydraulic Works (1975) points to the groundwater contamination resulting from the infiltration of geothermal fluid into the groundwater resources along the Omerbeyli Faultline. 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 double casings of the wells and cementing between these 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. In order to monitor the interaction with the hydrogeological environment during the geothermal drillings and energy production activities, 4 observation wells have been designated. Samples will be taken from these observation wells on a seasonal basis and analysed with respect to the defined parameters. The analyses results will be shared with the 21st Regional Directorate of the State Hydraulic Works. Changes in the parameters will be monitored on a regular basis.

emergency pond has been constructed to be used only by Efe-6 GPP. For Efe-7 GPP, a 7,500 m³ capacity emergency pond has also been constructed. There is a 9,600 m³ capacity emergency pond used by Efe-2 GPP, and a 7,500 m³ capacity emergency pond used by Efe-1 GPP. For Efe-8 GPP, a 15,000 m³ capacity emergency pond is planned to be constructed.

- 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 license since April 2019. The treated domestic wastewater is collected in impermeable tanks and used for irrigation of the plantings within the sites for the GPPs.
- For Efe-8 GPP Projects, wastewater generated by the workers is/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.

3.3 Biodiversity and Living Natural Resources

Flora and fauna site surveys for Efe-6, Efe-7 and Efe-8 GPPs were conducted within the scope of the national EIA studies in September of 2016, which provide the baseline data for the ESIA Addendum Report (2018). The ESIA Addendum Report (2018) provided further analyses on biodiversity features, with updates on previously identified species, especially those that have been recorded from literature as opposed to direct on-site observations.

The most up-to-date assessments made regarding priority biodiversity features that are “presumed present” at the Project Area are provided below in Table 3-5.

Table 3-5 Priority Biodiversity Features as per EBRD PR 6

Priority Biodiversity Feature	Presumed Present Project Biodiversity Feature
Threatened habitats	There are no habitats that overlap with the Project site that are under pressure by national, regional or international assessments. No natural and priority habitats identified under the EU Habitats Directive Annex I.
Vulnerable Species	There are two endemic oak species that were identified during the national EIA studies. Presence of these species was not identified/ reported in the Project area and these species were not observed during the site studies. There is also one reptile; <i>Testudo graeca</i> , and one bird; <i>Streptopelia turtur</i> , species that are listed as VU according to the IUCN Red List. Although assessed as a VU species due to its global population status, <i>Testudo graeca</i> is quite widespread in all of Turkey. The regional population status does not call for any species-specific measure. <i>Streptopelia turtur</i> , on the other hand, is presumed to be present in the area from literature records. The species is known to occur in all of Turkey. However, Project Area and its vicinity, where there are high levels of anthropogenic impacts, are not expected to be inhabited by the species' populations.

Priority Biodiversity Feature	Presumed Present Project Biodiversity Feature
Significant biodiversity features identified by a broad set of stakeholders or governments	There are no protected areas or designated sites within the vicinity of the Project Area, which would be impacted by Project-related activities.
Ecological structure and functions needed to maintain the viability of priority biodiversity features	There are no identified structures or functions in the area that are vital to priority biodiversity features

In order to determine statuses of species identified during the national EIA studies, besides the IUCN Red List of Threatened Species utilized to determine endangered and critically endangered species, other criteria were also used in the Critical Habitat Assessment, wherever applicable. In determining “highly threatened and unique ecosystems”, habitats listed under Annex I to Habitats Directive, as well as IUCN Red List assignments for ecosystems were used as the main criteria. Potential critical habitat trigger biodiversity features for the Project are summarized below in Table 3-6.

Table 3-6 Potential Critical Habitat Trigger Biodiversity Features for the Project

Critical Habitat as per EBRD PR 6	Potential Critical Habitat Trigger Biodiversity Feature
(i) Highly threatened or unique ecosystems	No such habitat or ecosystem
(ii) Habitats of significant importance to endangered or critically endangered species	No CR or EN species
(iii) Habitats of significant importance to endemic or geographically restricted species	<i>Quercus frainetto</i> and <i>Quercus aicheri</i> are two endemic oak species that have been reported to exist in the region, within the scope of the national EIA studies. Presence of these species was not identified/ reported in the Project area and these species were not observed during the site studies. Therefore, based on all available data, <i>Quercus frainetto</i> and <i>Quercus aicheri</i> do not trigger critical habitat at the Project Area.
(iv) Habitats supporting globally significant (concentrations of) migratory or congregatory species	No migratory or congregatory species
(v) Areas associated with key evolutionary processes	No such habitat or a species population
(vi) Ecological functions that are vital to maintaining the viability of biodiversity features described (as critical habitat feature)	No identified ecological functions that are vital to potential critical habitat trigger biodiversity feature

3.4 Noise

Within the scope of monitoring for Gurmat-2 GPP, 2 noise monitoring studies were conducted at 18 locations in the project area. The first monitoring, conducted in 2015, covered a total of 6 locations where the second monitoring, conducted in 2016, covered 12 locations including 6 locations of previous study. The nearest sensitive locations including schools and settlement locations (e.g., Germencik Anadolu School, Kizilcagedik Neighborhood Mosque) were selected as noise monitoring locations. None of the monitoring results exceed the national noise limit values and the noise level guideline values given in the World Bank Group’s General EHS Guidelines applicable to the Project.

Additionally, the national EIA for Efe-8 includes an assessment for the construction phase noise to be emitted from the construction activities, in terms of compliance with the Turkish Regulation on Assessment and Management of Environmental Noise (RAMEN). The assessment indicates that the construction phase limit of 70 dBA is ensured at approximately 125 m from the construction site where the closest residential area is located approximately 400 m away.

During the operation phase generators are/are expected to be the main noise generating sources. The Project operation activities are not expected to have any noise impact on local communities. The occupational exposure to noise is addressed below in Section 3.7.

3.5 Waste Management

The Project will follow the waste hierarchy, which responds to financial, environmental, social and management considerations. Related waste handling practices for the types of waste anticipated to be generated in the Project site are summarized below in Figure 3-2.

Drilling Mud	For production and reinjection wells drilled/ to be drilled within the scope of the Project, ponds covered with impermeable geomembrane layers are utilized to collect drilling mud. The drilling mud is analyzed by licensed laboratories for identification of its storage class. Depending on analysis results the collected drilling mud is either left on site or removed in accordance with related legislation.
Excavation Waste	Any excess excavated material that cannot be used on-site for filling and landscaping activities will be sent to excavation waste disposal areas.
Domestic Solid Waste	Municipal solid waste will be segregated and licensed firms and Aydın Metropolitan Municipality will transport these wastes for final disposal/ recycling.
Medical Waste	Medical waste will collected separately and sent by licensed transport vehicles to the medical waste disposal facility that has an agreement with Germencik Municipality.
Waste Oil and Waste Vegetable Oil	Waste oil will be collected in leak-proof containers, stored in temporary waste storage areas and sent to licensed disposal/ recovery firms.
Other Hazardous Waste	Waste batteries and accumulators, end-of life vehicles, waste tires, electronic waste and other hazardous and special wastes will be stored in temporary waste storage areas and sent to licensed reuse/ recovery/ recycling/ disposal firms.

Figure 3-2 Summary of the Waste Handling Practices for the Types of Waste anticipated to be generated in the Project Site

3.6 Labor and Working Conditions

Turkey is party to a multitude of International Labor Organization (ILO) conventions and accordingly, the current Turkish Labor Law is in compliance with international labor standards; including aspects such as child labor, forced labor, non-discrimination, equal opportunity and right to join workers' organizations.

During the field study conducted on March 2019, the Project had total of 239 employees hired under the Company's five subsidiary companies⁴. Furthermore, it was recorded that eight (8) women workers constitute 3,35 % and five (6) disabled individuals constitute 2,51% of the total employees. The employees originating within the provincial borders of Aydın are 151, which is 63,18% of the total employees. According to the Employee Manual, it was found that the youngest worker hired for the Project is 22 years old and the oldest is 65 years old.

According to the labor and working conditions assessment the following items have been found in compliance with PR 2 in terms of labor management:

- The Company fulfills commitments regarding to non-discrimination, avoidance of forced and child labor,
- All workers have indefinite terms of contracts and the copies of the contracts are given to the workers,
- There are 4 worker representatives who have been selected within the framework of the Labor Law,
- The conditions of workers' accommodations are in compliance with A Guidance Note by IFC /EBRD on Workers' Accommodation (2009).

Personnel Regulation, Human Resources Policy, Human Resource Procedure, Employee Manual, Workers Contracts, Supplier Evaluation Form, Procurement Procedure and Workers' Grievance Form have been prepared to manage labor and working conditions.

According to the consultations with the workers, as of now 8 employees are using the camp. The size of the rooms is around 20 meters and it is stated that camp conditions are adequate. The rooms have TV, single bed, work desk, WC- shower, TV and refrigerator, heating, iron and washing machine. During the construction of Efe-8 the capacity of the accommodation will be adequate since the construction workforce will be derived from local communities.

⁴ Within the scope of the Project, there are 5 companies that are affiliated to Guris Holding Co. Inc. Among these companies, Gür Enerji has the highest workers ratio with 52%.

There are 37 security personnel and a security supervisor hired for the Project. All security personnel are male. Two of the security officers are from other provinces and 35 of them are from Aydın. Excluding one of the officer, the rest of the security guards are armed. All security forces are trained in compliance with the national legislation (Law No: 5188 on Private Security Services, 2004). According to the field study and media review, no disputes have been recorded between security forces and local community throughout the Project's history.

During the assessment process, following items are considered to be improvement areas in line with EBRD PR-2 Requirements;

- Overtime management,
- Human Resource Management system,
- Adequacy of Workforce,
- Workers grievance mechanism,
- Management system for the security personnel of the Project.

After the assessment the Company is committed to implement the following mitigation and management measures to improve its existing implementation:

- Personnel shortage will be fulfilled,
- The HR Procedure and Personnel Regulation documents will be integrated and strengthened on non-discrimination and freedom to join organizations topics,
- All documents related to HR will be provided to the workers as an attachment of the contract and HR training will be provided to workers during the orientation process,
- The Company will have support in technical consultancy on gender awareness by EBRD,
- During the orientation process, training on all documents related to HR is required,
- An effective and culturally appropriate grievance mechanism needs to be improved for Project workers,
- A management plan for security personnel will be developed and implemented by the Company, outlining expectations around security, in line with the internationally acceptable standards.

3.7 Health and Safety

The assessment on potential impacts of the Project on Health and Safety related issues are mainly focused on following areas:

- H₂S emissions: In general, current ambient air quality monitoring results and assessments based on air quality modelling indicate that H₂S level are well below the existing national and international standards (see Section 3.1.) On the other hand, there is a rising public concern about H₂S in parallel to the increase of number of geothermal power plants in the region. H₂S is also malodorous, toxic gas, which poses health and safety risks in case appropriate monitoring and management practices are not in place.

- Infrastructure and equipment related hazards: It may be caused due to contact with hot surfaces such as active wells and pipelines, risks associated to equipment failures, intentional or unintentional damage to geothermal fluid's piping outside the boundaries of facilities and risks associated to abandoned wells and pits.
- Induce seismicity: Utilization of geothermal resources may cause induce seismicity especially at reinjection areas, which may alter the stress patterns of the area rock formations.
- Potential earthquake: According to the Earthquake Zones Map of Aydin province, the entire province is located in a 1st degree earthquake zone. Therefore, the main natural hazard risks are associated with earthquakes.

As reported by the Company, the requests and suggestions of the public are taken into account through the received grievances. Accordingly, the Company implements necessary actions for appropriate requests/suggestions from local communities.

- Gurmat is performing periodical ambient air quality monitoring study in the Project site, in order to ensure that potential health and safety risks due to H₂S emissions are managed appropriately, Additionally, Gurmat is working on H₂S reduction methods to minimize the odor problem (see Section 3.1 for details on H₂S management) and also to decrease the risk for the operational personnel to H₂S exposure.
- To date, no pipeline failures or similar emergencies occurred. Geothermal fluid collection systems are designed, diverting the collected fluid to emergency ponds during any rare case of equipment or pipeline failure. To minimize risks to communities;
 - Shortest routes are selected for the pipeline network,
 - Insulated pipes are used, which avoid thermal loss and therefore hazards associated with contact with hot surfaces,
 - Due to chemical characteristics of geothermal fluids, carbonate and sulphate can accumulate and create a crust on inner walls of pipes. This phenomenon result in limited flow rate and may eventually lead to leakages or pipeline failures. Therefore, chemical dosing (inhibitor injection) is conducted at each wellhead to prevent crust formation. This way, risk of failure and associated community health and safety risks are minimized; and as the pipelines are closed systems, these chemicals do not interact with the environment.
- 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 of Gurmat-1, Gurmat-2 and the Extension Project of Efeler GPP Project, using the Germencik reservoir). Even in this case, majority of the seismic activity cannot be sensed by local communities due to very small magnitudes of 1-3 and no grievances related to induced seismicity have been received yet. Therefore, a cumulative impact study is not of importance for the

determined cumulative impact assessment area (cumulative impacts 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 reevaluated.

- Detailed geological and geotechnical surveys and earthquake risk assessments are provided in the scope of the GPPs' Geological and Geotechnical Survey Reports (presented as annexes to EIA Reports). The emergency cases of equipment or pipeline failures and well blow-outs are addressed in Section 3.2. The Project GPPs are/will be in full compliance with provisions of national legislation regarding constructions on 1st degree earthquake zones.

3.8 Land Acquisition, Involuntary Resettlement and Economic Displacement

All parcels required for the Project and its associated facilities are acquired; and land acquisition is complete. In order to verify the process of land acquisition and how the compensations are spent to assess livelihood impacts; 34 phone interviews are conducted with previous owners of the parcels. Land acquisition team starts negotiations after completion of geological and technical studies. Geological studies highlight the area that could be acquired for Project needs. Minimum 0.8 hectare of land is required per well. Once the location is confirmed, land acquisition team starts consultations with landowners for willing buyer seller negotiations. Guris emphasized the importance of willing buyer seller negotiations for land acquisition. If the landowner does not agree to sales, neighboring parcel is approached for acquisition. 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. Guris acquired all land for the Project through mutual agreement; and did not resort to any expropriation for the Efe- 6, Efe-7 and Efe-8 GPPs. All owners stated that the compensation paid by the Project was above market prices; and compensations were received fully.

When Project-Affected People (PAPs) were asked about how they utilized compensation; some said they were able to replace and expand their land, some have invested in real estate and/or deposited it in the bank. Once the site is acquired by the Project through willing buyer seller negotiations, compensation is paid to rightful owners and deed is transferred, Guris fences off land acquired for the Project. If the land has any crops, Project waits for the end of cropping season to fence off the land. There are no outstanding grievances pertaining to land acquisition for willing buyer seller led permanent land acquisition.

Land acquisition for pipelines is conducted by two methods; obtaining right of way or leasing the land. The Project acquires right of way for 49 years or 99 years, depending on Project's needs. 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. Compensation payment is one off payment for the duration of contract. Land acquired for pipeline varies from 5 meters minimum to 10 meters maximum width; and pipeline follows natural roads or parcel border to avoid adverse impact to parcel use. The owner of the parcel

is given access to the land through an omega shaped access point. The owner of the parcel is asked for his preferences and his/her regular route of access to the parcel.

No physical displacement occurred as a result of land acquisition.

The assessment study indicates that following areas are open for improvement in line with EBRD PR – 5 requirements:

- Formation of a land acquisition policy and procedure that depicts Guris's existing land acquisition approach, commitment and valuation strategy. And, development of a recording mechanism for asset census, valuations for land and standing assets (trees, crops) versus actual payments.
- Monitoring of land acquisition activities regarding associated facilities such as transmission lines in line with EBRD's PR5, in order to ensure all PAPs are compensated according to applicable standards (including national legislation and PR 5).
- Improvement of the grievance mechanism to capture all land acquisition related complaints, grievances and requests.
- A 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.

After the assessment the Company is committed to implement the following mitigation and management measures to improve its existing implementation.

- Project Company will develop a Corporate Land Acquisition Policy and Procedure.
- Project Company will use its best effort to monitor the land acquisition process carried out by TEİAŞ for high voltage transmission lines in order to provide responses to potential inquiries in that matter.
- The Project Company will ensure that Grievance Redress Mechanism (GRM) is extended all land-acquisition related activities.
- Project will monitor potential 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.

3.9 Cultural Heritage

According to the national EIA Reports, the Project GPP areas do not correspond to any registered cultural heritage sites or natural protection sites.

As general implementation, in case any cultural heritage is encountered during land preparation or construction phase, as per national requirements, related Museum Directorate or Regional Board Directorate for Conservation of Cultural and Natural Assets will be informed. These local authorities will determine the process for handling the chance find. In

this respect, a Chance Find Procedure will be put in place for management of the chance finds particularly during the piping works as part of Efe-8 GPP.

3.10 Information Disclosure and Stakeholder Engagement

Public participation to EIA process is a legal obligation for the project owner as per the 1st clause of Article 9 of the EIA Regulation. Project owner has to organize a Public Participation Meeting (PPM) at a location easily accessible by the people affected by the project. The meeting is conducted on a date which is determined in agreement with the MoEU. The aim of the meeting is to inform project affected people about the investment and to obtain their opinions and comments regarding the Project.

Accordingly, the Final Draft of the EIA Report is disclosed by the MoEU and the related Governorate(s) for 10 calendar days through announcement boards and at the internet page of the MoEU. Any view or comment received from public in this context is considered by the MoEU in the decision-making process. Finally, the MoEU requires the Consultant to submit the Final EIA report with a statement indicating that the report and its annexes are under the commitment of the project owner. Taking the Commission's evaluations and the public views, MoEU gives its "EIA Positive" or "EIA Negative" decision regarding the project. At the latest stage, the decision of the MoEU is also disclosed to public using appropriate means.

As per EBRD PR-10, a Stakeholder Engagement Plan (SEP) has been prepared within the scope of the Project, engagement activities and monitoring commitments will be implemented throughout the lifetime of the Project. Project specific stakeholders and communication tools are described in SEP.

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 the ESA (2019).

The Company has carried out stakeholder meetings additional to stakeholder engagement activities in the scope of national EIA requirements as;

- a meeting was held with the members of the Municipal Council of Germencik in February 2019 as a part of SEP.
- the Company has organized a workshop at Germencik March 2017 with multiple stakeholders on "Living with Geothermal Energy".

There is a public grievance mechanism in place with designated staff to receive grievances through phone/mail/email lines, grievance forms.

Table 3-7 below includes the communication tools for the Project.

Table 3-7 Contact Details for the Project

Office	Contact Details
Gurmat Head Office	Address: Ankara Caddesi No: 222, Karaoğlan Mahallesi, Golbasi, 06830, ANKARA Telephone number: +90 (312) 484 05 70 Fax: +90 (312) 484 45 78 E-mail: info@gurmat.com.tr Website: www.mogan.com.tr Contact Name: Yeşim Erdemir- Zeynep Yarga
Project Site	Address: Omerbeyli Koyu Mevkii, Germencik, Aydin, Turkey Telephone number: +90 (256) 563 33 25 Fax: +90 (256) 563 35 11 Contact Name: Necati Bayrakoğlu-Senem Bulut

Assessment findings in terms of information disclosure - stakeholder engagement addresses the following areas for improvement:

- Increase of the effectiveness of the Grievance Mechanism: Dissemination and recording.
- Increasing the effectiveness of stakeholder consultation: Providing more gender based opportunities, increase engagement with women,
- Effective implementation of SEP: Regular update depending on project evolvement, continues stakeholder engagement and record keeping.

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

- Training the social team of the Efeler GPP Extension Project on EBRD requirements, SEP and ESA documents.
- In line with SEP Project Company will conduct regular meetings with district level Public Institutions rather than need-based meetings.
- SEP also defines regular information sharing and consultation meetings for all affected communities and mukhtars.
- Project Company will disclose ESA Report, SEP, NTS and ESAP locally and via the website.
- 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.
- Increase gender diversity for the social team of the Efeler GPP Extension in order to engage in a gender and culturally appropriate manner.

- In order to immediately record grievances received while visiting the field, a feedback form so that once the PAP states a grievance the grievance can be recorded immediately on paper and the feedback form will be return to CR in a same day. These feedback 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, dedicated phone line, etc.) to affected PAPs in affected settlements and mukhtars.
- 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.

3.11 Corporate Social Responsibility

The 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.

A tour of the facilities was carried out during the meeting and the stakeholders were informed about existing and planned social investments. Company's CSR investments range from education to livelihood restoration through a wide array of activities. Scholarships have been provided to young female university students; schools have been renovated, robotics teams have been supported; and a vocational high school has been built to support education. Company has distributed and planted over 16,000 fig saplings in all Project affected settlements since 2009. The Project Company will 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.

3.12 Permitting and Legal Compliance

As stated in Section 2.1 above, Gurmat is addressing the concerns raised by Aydin Environment and Nature Association in court in the course of the legal proceedings, and commissioned additional studies, summarized in this disclosed Non-Technical Summary ("NTS") and other components of the 2019 Disclosure Package, comprising an updated Environmental and Social Assessment ("ESA"), an Environmental and Social Management and Monitoring Plan ("ESMMP"), a Stakeholder Engagement Plan ("SEP") and an Environmental and Social Action Plan ("ESAP") comprising legally binding environmental and social commitments of the Company. This NTS and additional supplementary documents as part of the 2019 Disclosure Package are being published to address concerns raised. In parallel the Company is pursuing closure of all legal proceedings regarding Efe-8 GPP's EIA permitting.

The arguments put forward by Aydin 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.”

Yet, the recent decision of the 14th Division of the Republic of Turkey Presidency of the Council of State dated December 27, 2018 (Docket No. 2018/5091 Decision No. 2018/8330) has 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 Electric can proceed with the construction works. In this respect, the dispute must be reconsidered by the 2nd Administrative Court of Aydin and a new verdict must be rendered. On that account, an additional expert examination report is required to be prepared in relation to the potential effects 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). In other words, a new process regarding “re-examination of the files with respect to the additional expert examination report” should be started in the 2nd Administrative Court of Aydin.

According to the information provided by Gurmat Electric, a new EIA process for Efe-8, which had been started with a new consultant (Cinar), was stopped after the reversal decision of the 14th Division of the Presidency of the Council of State due to the fact that there is no need for a revised EIA Report or process as per the decision of the Council of State. Yet, Gurmat Electric already has an assessment report in place about the impacts of geothermal power generation on olive production, which was prepared as an annex to the prospective revised EIA Report. In addition, a hydrogeological investigation report has been prepared for the prospective revised EIA Report.

4. CUMULATIVE IMPACT ASSESSMENT

A cumulative impact assessment (CIA) is undertaken when a series of developments, all of which are the same type (GPP), are occurring or being planned within an area where they would impact the same valued environmental and social components (VESC). The VESCs may include physical features, social conditions and cultural aspects.

A six-step approach, as proposed by the IFC, has been followed to conduct a CIA for the Project. Accordingly, first spatial and temporal boundaries were determined followed by identification of VESCs and all GPP developments within the study area, determination of present conditions of the VESCs, assessment of cumulative impacts and evaluating their significance.

In identifying other contributing projects within the CIA Study Area, focus is given on GPP projects, as they would have common types of impacts that would affect the same VESCs. Existing and future projects that have been identified and included in the CIA together with the Project GPPs are presented below in Figure 4-1.

Certain (Existing)	Reasonably Foreseeable	Hypothetical
• Gurmat Projects: • Gurmat-1 GPP • Gurmat-2 GPP (Efe-1, Efe-2, Efe-3, Efe-4 GPPs) • Efe-6 and Efe-7 GPPs (as part of the Project) • Other Projects: • Mehmethan GPP • Kubilay GPP • Kerem GPP • Maren GPP • Deniz (Maren II) GPP • Gumuskoy GPP • Melih GPP • Senkron Efeler Biogas Power Plant	• Gurmat Projects: • Efe-8 GPP (as part of the Project) • Other Projects: • Kubilay GPP-2 • 3S Kale GPP	• Other Projects: • Mehmethan GPP (Unit V) • Kerem GPP (Unit IV) • Maren VI GPP • Maren VII GPP

Figure 4-1 Existing and Future Projects that have been identified and included in the CIA together with the Project GPPs

Potential environmental and social issues identified within the scope of the Project national EIAs and this ESA Report (2019) have been screened in consideration of identified existing and reasonably foreseeable future projects demonstrated in Figure 4-2 below to determine potential cumulative impacts. In addition, the findings of the Commission Report prepared by the commission authorized by Efeler Municipality to identify potential environmental and social risks geothermal power plants were also considered during identification of potential cumulative impacts. The impacts identified by the said Commission Report, which are assessed to be of cumulative importance, include the following:

- H₂S emissions in terms of health and safety, including toxicity and odor,
- Permanent change in the land use characteristics and loss of agricultural land,
- Microclimatic impacts,
- Vapor visual impacts,
- Potential discharge of geothermal fluids to receiving environments leading to chemical and thermal pollution and especially impacts to agricultural production as a result (this impact not included in this CIA study as Gürmat Electric reinjects the entirety of spent geothermal fluids),
- Induced seismicity.

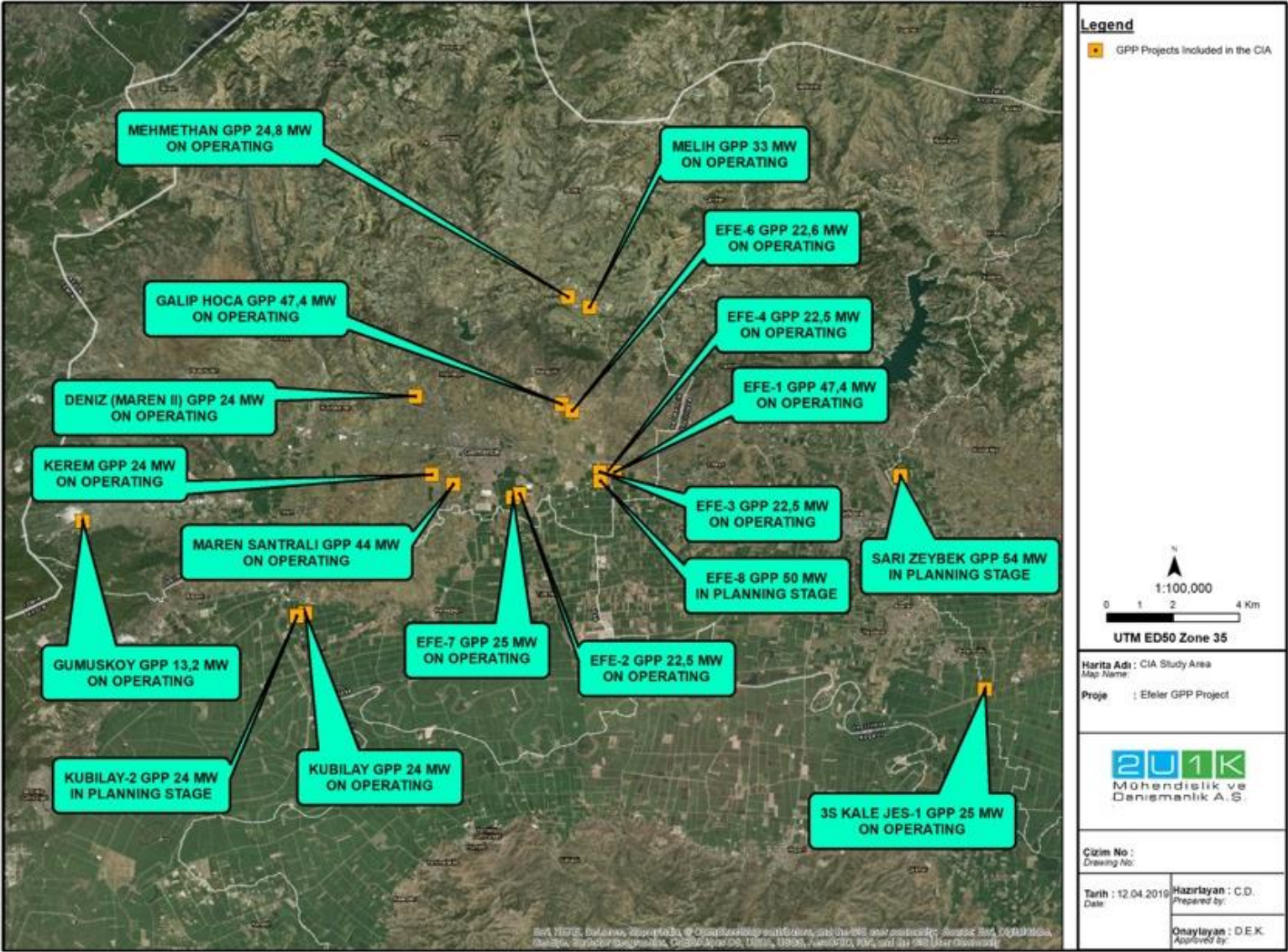


Figure 4-2 Identified CIA Study Area

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 periods by considering the cumulative impacts of multiple projects in a basin. In this respect, cumulative H₂S emissions, specifically in terms of impacts on local communities due to odor, will 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.

In general, the existing monitoring data regarding operation of the existing Gurmat-1, Gurmat-2 and Efeler GPP Projects including extension units (Galip Hoca, Efe-1, Efe-2, Efe-3, Efe-4, Efe-6 and Efe-7), which are in compliance with the national and international limit values, indicate that no major impact is 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. Public concerns in the region reached to top level with the increase of GPP investments. In this respect, for the management of cumulative impacts, 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 Gurmat 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 has started a cumulative impact assessment study with the support of the EBRD. In the study, the 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 such as Geothermal Association (JESDER), Agricultural Credit Cooperative and Germencik Fig Research Institute would be required. Gurmat Electric will participate and contribute to such a study.

5. ENVIRONMENTAL AND SOCIAL ACTION PLAN

To ensure prevention and minimization of potential environmental and social impacts associated with the Project and to ensure best practices are maintained and implemented throughout all phases of the Project, an Environmental and Social Action Plan (ESAP) has been developed for the Project and disclosed within the ESA Report (2019). The ESAP includes among others:

- Gürmat will comply with national legislation and good industry practices,
- Implement an EHS and social management system (EHSSMS) throughout its operations based on certified international systems such as ISO 14001,
- Implement the recommendations included in the ESA and corresponding ESMMP,
- Do not discharge any water from the site,
- Provide a yearly public update on E&S performance” as per item 10.3 of ESAP,
- Participate in the Ministry funded Cumulative Assessment and provide data to the study,
- Continue to maintain an open line of communications with local stakeholders as per SEP.

Contact Information

Project related information will be available on a dedicated web page of Gurmat Electric. The ESA documents will also be publicly available for affected communities at the Project Sites. Contextually appropriate methods such as distribution of leaflets, posting information on information boards within the community, etc. will be used to publicize the disclosed documents.

Further information on the Project, as well as copies of environmental and social impact assessment studies can be found by contacting Gurmat Electric.

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