



Final Report

# Mid-Size Sustainable Energy Financing Facility (MidSEFF) Umurlu II Geothermal Electric Power Plant: Non-Technical Summary (NTS)

August 2016

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**European Bank for Reconstruction and Development**

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The European Bank for Reconstruction and Development (EBRD) launched in January 2011 a financing facility aimed at scaling up Renewable Energy and Energy Efficiency investments in Turkey, to increase the country's energy savings and decrease its carbon emissions. The Turkish Mid-Size Sustainable Energy Financing Facility (MidSEFF) launched by the EBRD with support from the European Investment Bank (EIB) and European Commission (source of the Technical Cooperation funds) will provide a total of EUR 975 million in loans through 7 Turkish banks for on-lending to private sector borrowers.

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Umurlu II GEPP – Non-Technical Summary (NTS)				Controlled Copy	
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## Acronyms

dBa	decibel
EBRD	European Bank for Reconstruction and Development
ETL	Energy Transmission Line
GEPP	Geothermal Energy Power Plant
MidSEFF	Mid-Size Sustainable Energy Financing Facility
MoFAL	Ministry of Food, Agriculture and Livestock
NTS	Non-Technical Summary
PC	Project Consultant
TEDAS	Turkish Electricity Distribution Company
The Sponsor	Karadeniz Holding-Karadeniz Energy Group
WPP	Wind Energy Power Plant

# 1. General Plant Description

Umurlu II Geothermal Power Plant project is located in Aegean Region of Turkey, Aydın Province, Merkez and Köşk Districts, Pınardere Village (Figure 1-1).

The Project will be a binary cycle 12-MWe power plant using an Organic Rankine Cycle (ORC) system. Table 1-1 presents the key aspects of the project.

Electricity Production Preliminary License for 12 MWe-Umurlu-II GEPP has been obtained from EMRA (The licence numbered ÖN/4991-2/02979 dated 30<sup>th</sup> April 2014) and “EIA not required” decision has been received on 26<sup>th</sup> November 2013.

Aegean region: province subdivision



Figure 1.1: Project Location

**Table 1-1: Key project summary data**

<b>Project Name</b>	Umurlu II Geothermal Electric Power Project
<b>Project Borrower</b>	Karkey Karadeniz Elektrik Üretim A.Ş.
<b>Project Sponsors</b>	Karadeniz Holding-Karadeniz Energy Group
<b>Project Description / Business Purpose:</b>	<p>The location of the proposed geothermal power plant is in the Aegean Region, Aydın Province, Merkez-Köşk boroughs, Umurlu District.</p> <p>Umurlu II GEPP project contributes to the share of renewable energy in the Turkish energy market. The generation of electricity from renewable source will replace the electricity from the national grid and potentially enable the reduction of 37,298 tCO<sub>2</sub>/year (calculated for base case scenario of electricity generation).</p>
<b>EBRD Transaction</b>	<p>The total project cost is USD 47,273,824, including USD 41,224,875 fixed investment cost, USD 3,614,125 VAT, USD 579,901 commitment and arrangement fee, USD 1,539,900 investment period interest and USD 315,023 working capital requirement. The debt financing amount of the investment will be USD 36,400,000 by EBRD resources. The debt to equity ratio is calculated as approximately 76:24%.</p>
<b>Project Type</b>	Geothermal Electric Power Project
<b>Installed Power</b>	12 MW <sub>e</sub>
<b>Annual Electricity Production</b>	72 GWh/year



## 2. Environmental and Social Baseline

### 2.1 Environmental description of the project area

Both wells and the planned powerhouse are in close proximity of Serçe and Umurlu Villages and several scattered houses are around the project site. The nearest house (Umurlu Village) to the project area is 150 m away from the well A5. The wells locations are surrounded by agricultural areas and Emirdoğan Stream is located 1.5-2 km away from the project site.

According to the Project Information Report (PIR), there is no designated area within the project site, such as natural, protected and sensitive areas. The project site is located on private lands used by the owners for agricultural purpose. The majority of private lands (approximately 28.000 m<sup>2</sup> (100%) of power plant area and 90% of well area) has already been purchased by mutual agreements. The PIR also highlights that no cultural goods/heritage are found in the project area.

As a result of flora studies carried out in the preparation of PIR, there is no flora species as endemic, rare or under protection by national or international agreements. As the result of fauna studies carried out in the study area, all species are listed least concerned (LC) category under the IUCN. 14 species identified in the region are under BERN (Annex III) and 1 specie is under BERN (Annex II).

**Table 2-1: Environmental characteristic**

ENVIRONMENTAL ASPECTS	PRESENCE/DISTRIBUTION	COMMENTS
Land use	The project area consists of private lands	Most of the lands has been purchased by mutual agreements
Surface water resource	Emirdoğan Stream is located 1.5-2 km away from the project site	-
Protected area	There is no natural, protected and sensitive areas within the project site.	-
Flora and Fauna	No endemic, rare or protected flora species. 14 fauna species identified in the region are under BERN-Annex III and 1 species under BERN-Annex II.	-

### 2.2 Social condition of the project area

The total population of Aydın Province in 2015 was 1,053,506 according to the Turkish Statistical Institution.

The two dominant sectors composing the economy of Aydın Province are agriculture and tourism. Thanks to Greater Menderes River, irrigating generous plains, and the suitable climatic conditions, a very wide range of plants can be cultivated in the province. Olive, fig, chestnut and cotton are the products with highest contributions to the economy of the province.

Both wells and the planned powerhouse are in close proximity of Serçe and Umurlu Villages and there are scattered houses around the project site. The nearest house is located 150 m away from the well A5.

## **3. Social and Environmental Impact**

### **3.1 Land use**

The project site is located on private lands used by the owners for agricultural purpose. The majority of private lands has already been purchased by mutual agreements.

### **3.2 Water**

There will be household waste water both during construction and operation phase. Based on the assumption that the daily domestic water requirement is 150 litres per person and considering 50 employees during the construction phase and 8 employees during the operation phase, the domestic wastewater production is estimated to be 7.5 m<sup>3</sup>/day in the construction phase and 1.2 m<sup>3</sup>/day in operation phase. Domestic wastewater generated will be collected in impermeable septic tanks constructed in line with related Turkish regulations. The domestic wastewater will be collected by vacuum trucks of the related Municipality.

Geothermal liquid occurs during drilling operations. Mud pits are designed by leak-proof material and placed in all the well areas, approximately 400-700 m<sup>3</sup>. Geothermal liquids which are taken out of the wells during the testing process are let sit on mud-pits until they cool down by evaporation.

### **3.3 Waste**

There will be domestic waste and construction waste, excavation materials, demolition waste and hazardous waste as a result of construction activities. This waste will be managed according to the related national regulations.

Daily domestic solid waste production is assumed as 1.15 kg per person, considering 50 employees during the construction phase and 8 employees during the operation phase, the domestic waste produced will be 57.5 kg/day and 9.2 kg/day, respectively. The recyclable waste will be collected in separate waste containers.

### **3.4 Top Soil and Soil removal**

The construction works will include site clearing/levelling, slope stabilization works and construction of project units including powerhouse, electric power transmission lines and wells.

The total amount of topsoil to be stripped is estimated to be around 3,500 tonnes. To minimize the impacts on the topsoil, the stripped material will be carefully removed and stored to avoid deterioration due to the weather conditions. During the topsoil stripping, the impurities will be removed from the soil. In order to preserve soil fertility, the piles will be slightly compacted and covered with organic material or green seeding with pioneer plant species. The stripped topsoil will be used in the future landscaping works.

### **3.5 Land Stability**

According to the technical assessment report, there is no slope instability either the risk of a landslide at the Project site.



### 3.6 Air Emissions

Potential impacts of the Umurlu II GEPP on air quality will occur basically during the construction phase of the project. During the operation phase, NCGs will be the most critical aspect.

Dust formation from earthmoving activities and other exhaust gas emissions from construction machinery will be the main sources of impacts on air quality during the construction phase of the project. Impacts on the air quality, mainly due to dust emissions due to excavation works, will be observed temporarily during the construction phase. Total excavation amount is expected to be about 7,500 tonnes. Dust estimated emissions generated at the project area are 0.73 kg/hour (uncontrolled) and about 0.36 kg/hour (controlled). This value is under the legal limit value of 1 kg/hour and a modelling study is not necessary. The air emissions that will also occur due to the use of the vehicles are below the legal limit values and for this reason, a modelling study is not necessary.

Trace amount of gas, mainly in the form of H<sub>2</sub>S, could be produced during the drilling operations. However, such releases would be minor in volume and would occur only in short time periods, the impact will be limited to the working area. Since there are agricultural areas around the project area, any damages on harvest must be avoided and necessary precautions must be taken.

Regarding the NCGs, the Sponsor is required to analyse, plan and implement suitable CO<sub>2</sub> emission mitigation measures. These will include the installation and operation of the necessary equipment for either reinjection or capture of CO<sub>2</sub> and other non-condensable gases aimed at avoiding their venting to atmosphere and limiting CO<sub>2</sub>-equivalent emissions to an absolute maximum of 350 kg/MWh during the operation phase.

### 3.7 Noise

Noise emissions will be generated during construction due to earthmoving works; operation of construction machinery and equipment; construction of power plant/piping and equipment installation; drilling and fluid collection and reinjection system (FCRS).

The overall impact of noise level during construction phase with respect to distances has been assessed in the PIR. For the worst case scenario, within a distance of 250 m, the resulting cumulative noise level for construction phase is found as 64,62 dBA which is below the noise limit values (70 dBA) defined by the Regulation on Assessment and Management of Noise.

During the operation phase, the sources of noise will be the machinery and equipment (turbines, pumps etc) in the plant. In the PIR, the cumulative noise level of Umurlu GEPP I and II in the operation phase has been calculated as 68.22 dBA for a distance of 500 m which is below the noise limit value of 70 dBA defined by the Regulation on Assessment and Management of Noise.

### 3.8 Subsidence

Subsidence occurs as a result of internal loading and/or extraction or alteration of material below the surface. The re-injection could be a solution to avoid the subsidence. On the other hand, this action can increase the fluid pressure and induce micro-seismic activities. The pressure increase, however, is not expected to be significant since geothermal fluids will be withdrawn simultaneously from nearly the same horizon.

In the PIR, the monitoring of the subsidence of the area and of the seismic events are not foreseen. Due to the fact that there are other GEPPs in the surroundings, the PC requires to conduct a monitoring activity for subsidence and of the seismic activity during the operation phase. For the seismic test, the sponsor informed the PC that it is intended to place seismic sensors in the wells of first phases then replace them in the second phases' wells.

### 3.9 Landscape

The plant will include the horizontal structure (pipeline) and some vertical structures, such as cooling tower or other facilities. Pipelines will be constructed both underground and on the ground. Although there is no national regulatory requirement, the PS is required to make an assessment of visual impacts by a photomontage study.

Due to the earth moving works conducted during the construction of powerhouse plant and well locations, a landscape reinstatement plan must be prepared. There will be no tree cutting planned, in case it occurs, replantation is required.

**Table 3-1: Impact Quantification**

COMPONENT	IMPACT	QUANTIFICATION
Land use	<u>Different use of the land</u>	Total area of Umurlu GEPP is 2 km <sup>2</sup>
Water	<u>Utilization and Discharge</u>	7.5 m <sup>3</sup> /d during construction and 1.2 m <sup>3</sup> /d during operation
Waste	<u>Production of solid waste</u>	57.5 kg/day during construction and 9.2 kg/day during operation
	<u>Excavation waste</u>	7,500 ton
Top Soil and Soil	<u>Stripping top soil</u>	3,500 ton
Land Stability	<u>Landslide</u>	-
Emissions	<u>Noise</u>	Construction phase < 70dBA (regulatory limit) Operation phase: no disturbance for the nearest receptors
	<u>Particulate</u>	< 1 kg/hour (regulatory limit)
	<u>NCGs</u>	Operation phase: Limiting the NCGs to a maximum value of 350 kh/MWh
Subsidence	<u>Change of the ground level</u>	-
Landscape	<u>Changes in the aspect of the area</u>	a photo simulation study to assess visual impact of the plant

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