

# **Non-Technical Summary (NTS) for Balıkesir-1 Wind Farm in Balıkesir, Turkey**



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## List of Abbreviations

EIA	Environmental Impact Assessment
EMRA	Energy Market Regulatory Authority
Enerjisa	Enerjisa Enerji Üretim A.Ş.
ETL	Energy Transmission Line
IUCN	International Union for Conservation of Nature
MENR	Ministry of Energy and Natural Resources
MWe	Megawatt electricity
NTS	Non Technical Summary
PDoEF	Provincial Directorate of Environment and Forestry
PDR	Project Description Report
TEIAS	Turkish Electricity Transmission Company
TUBIVES	Turkish Plants Data Service
WFP	Wind Farm Project

## 1.0 Project Description

### 1.1 Proposed Project

Enerjisa Enerji Üretim A.Ş. (Enerjisa) proposes to develop Balıkesir-1 Wind Farm Project (WFP) (Project) with an installed capacity of 142.5 MW in Balıkesir Province of Turkey. Enerjisa obtained a 49-year “electric power generation license” (License No: EU/1167-6/839, dated April 18, 2007) from the Energy Market Regulatory Authority (EMRA) for the proposed Project.

The Project will annually generate 549.2 GWh of electrical energy through 52 wind turbines (General Electric 2.75 – 103 model wind turbine). The electricity will be connected to the Poyraz WFP - Balıkesir Transformer Station II energy transmission line (ETL) through a 154 kV capacity 4.5 km long overhead ETL as approved on June 23, 2010 by Turkish Electricity Transmission Company (TEİAŞ).

### 1.2 Energy Needs

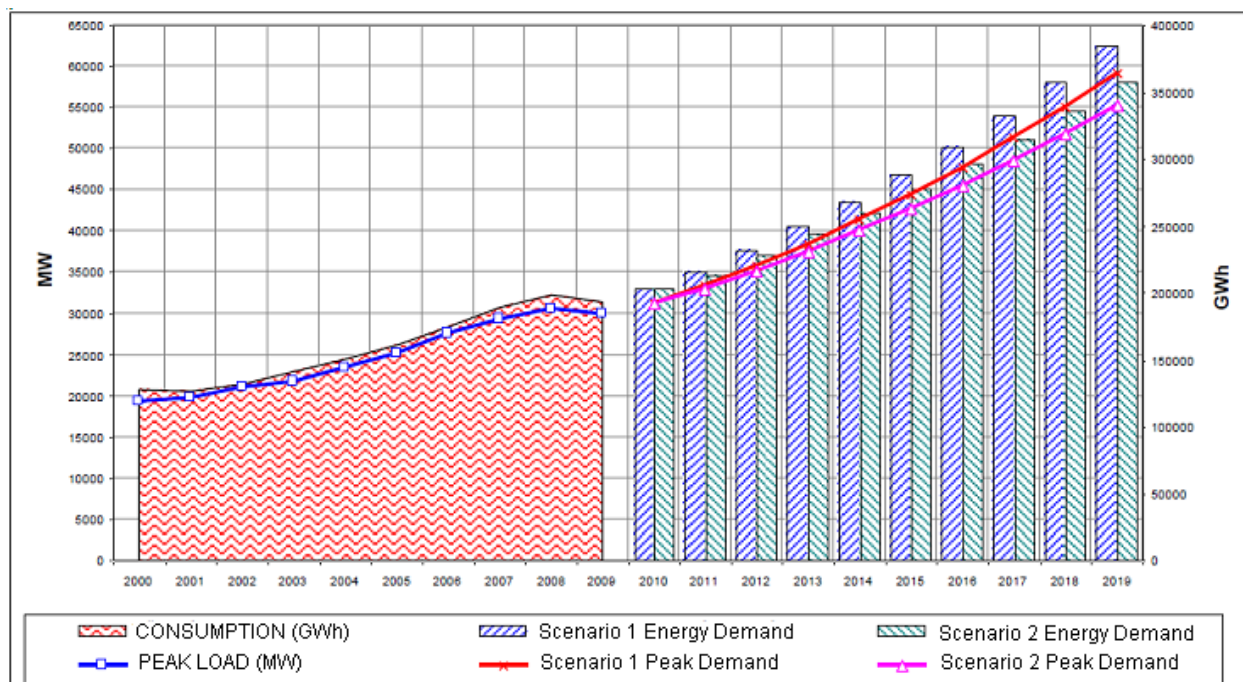
The power industry is a large, high-growth sector in the Turkish economy. The industry contributes significantly to the country's GDP and is a \$12 billion industry at current end-user prices. The sector's share in the Turkish economy has been growing rapidly with the 8% per annum growth in electricity demand over the past two decades. Turkey has an increasing energy demand. This rate of demand growth has been higher than the growth rates seen in other major Turkish industries and outstrips growth in the Turkish economy overall (Gençyılmaz, 2009).

Instantaneous peak demand and energy demand of Turkey interconnected electricity system is presented in Table 1-1 and in Figure 1-1 (Turkish Electricity Transmission Company, 2010). As seen in the table, energy demand has reached 198,085 billion kWh in 2008 with an increase of 4.2% compared to 2007, whereas energy demand has recorded as 194,079 billion kWh in 2009 with a decrease of 2%. The reason for this decrease is global economic crises. In addition, in 2008, the peak demand was 30,517 MW and by the end of 2008, the installed power capacity of Turkey was 41,817 MW. In 2009, the peak demand was 29,870 MW and by the end of April 2011, the installed power capacity of Turkey was 50,422 MW.

**Table 1-1 Interconnected Electricity Power System Peak Power and Energy Demand**

Years	Peak Demand (MW)	Increase (%)	Energy Demand (GWh)	Increase (%)
2000	19390	2.4	128,276	8.3
2001	19612	1.1	126,871	-1.1
2002	21006	7.1	132,553	4.5
2003	21729	3.4	141,151	6.5
2004	23485	8.1	150,018	6.3
2005	25174	7.2	160,794	7.2
2006	27594	9.6	174,637	8.3
2007	29249	6.0	190,000	8.8
2008	30517	4.3	198,085	4.2
2009	29870	-2.1	194,079	-2.0





**Figure 1-1 Interconnected Electricity Power System Peak Power and Energy Demand**

(Source: TEIAS, October 2010)

It was reported that the capacity of wind farms under operation is 1414.55 MW and the capacity of wind power plants under construction is 749.95 MW (TUREB, March 2011). According to the Ministry of Energy and Natural Resources (MENR), the potential wind power in Turkey is prescribed to be a total of 8,000 MW of installed capacity for high efficient regime facilities and a total of 40,000 MW of installed capacity for moderately efficient facilities. The purpose of this Project is to utilize wind energy potential and to compensate energy requirement through a sustainable, environmentally and cost effective way.

### 1.3 Project Alternatives

Various project alternatives were reviewed in detail for a) location; and b) technology included a discussion in the local Environmental Impact Assessment (EIA) Report. During the determination of location and technology of the proposed Project, technical/commercial aspects (wind resource and energy generation potential, ground condition, site access and electrical connection to national electricity network) and environmental and social aspects (current land use, established easement, surface and groundwater systems, river basins, flora and fauna including migration pathway, wildlife, forest areas, archeological sites, protected areas, naturally conserved areas, settlements, interaction with national aviation, recreational uses and telecommunication lines) were assessed.

After a desktop study was completed, six alternatives for project site were proposed. The proposed Project location was selected among these six locations considering the technical/commercial aspects and environmental and social aspects mentioned in the previous paragraph.



## **1.4 Environmental Impact Review Status**

According to the Turkish Environmental Impact Assessment (EIA) Regulation, an environmental Project Description Report (PDR) is required for the development consent of the Project. A local environmental consulting company has prepared a Project Description Report (PDR) for the proposed Project and submitted it to the Balıkesir Provincial Directorate of Environment and Forestry (PDoEF). The Balıkesir PDoEF reviewed the PDR and issued an “EIA is not Required” decision for the proposed Project on November 29, 2007. This decision is considered as development consent and enables the project to secure other permits required by the relevant Turkish regulations.

An energy transmission line (ETL) will be constructed within this project with a capacity of 154 kV and length of about 4.5 km. In accordance with the Turkish EIA Regulation, ETLs with a capacity of 154 kV and length of 5 km and less are exempted from the EIA review process. However, a limited assessment related to the ETL is also presented in this non-technical supplementary report.

## 2.0 Regulatory Framework

### 2.1 Generation License

All energy producers need to secure a Generation License from Energy Market Regulatory Authority (EMRA) prior to developing new power projects. Hence, Bares Elektrik Üretim A.Ş., the project company, has applied to the EMRA for production license. This application was approved and a “49-year electric power generation license” for the proposed project (License No. EÜ/1167-6/839, dated April 18, 2007) has been secured from the EMRA by Bares Elektrik Üretim A.Ş., which is owned by Enerjisa.

### 2.2 Local Environmental Regulatory Framework

The Turkish Environmental Law provides the legislative framework for the regulation of industries and their potential impact on the environment. Industrial projects are subject to varying levels of review that begin while projects are in the development and pre-operation phases. Additional regulations apply to facilities once they are in operation.

The Environmental Law authorized the promulgation of a number of regulations. Those that pertain to development and operation of the proposed power project are the following:

- Environmental Impact Assessment Regulation;
- Regulation on Assessment and Management of Environmental Noise;
- Water Pollution Control Regulation;
- Regulation on Construction of Cesspits;
- Regulation on General Principles of Waste Management;
- Hazardous Wastes Control Regulation;
- Waste Oil Control Regulation;
- Vegetative Waste Oil Control Regulation;
- Solid Waste Control Regulation;
- Medical Waste Control Regulation;
- Packaging Waste Control Regulation;
- Waste Batteries and Accumulators Control Regulation;
- Excavation, Construction and Demolition Waste Control Regulation;
- Regulation on Soil Pollution Control and Contaminated Sites by Point Source;
- Regulation Related to Workplace Opening and Operation Permits;
- Regulation on Control of Polychlorinated Biphenyls and Polychlorinated Terphenyls
- Air Quality Assessment and Management Regulation;
- Air Pollution Control Regulation for Heating Sources;
- Regulation on Reduction of Ozone Layer Depleting Substances; and
- Exhaust Gases Emission Control Regulation.

In addition to the Environmental Law and its associated regulations, there are several other laws that directly or indirectly include environmental review, and thus, are applicable to the proposed project. These are:

- Labor Law;
- Occupational Health and Safety Statute;
- Health and Safety Regulation for Construction Works; and

- Regulation on Health and Safety Regarding Temporary Works.

Other regulations that the project will comply with can be listed as follows:

- Law on Protection of Cultural and Natural Heritage;
- Pasture Law; and
- Forestry Law.

### **2.3 Environmental Impact Assessment Process**

The first Environmental Impact Assessment (EIA) Regulation was published in Official Gazette No. 21489 dated February 7, 1993. The EIA regulation was subsequently revised three times. The final version of EIA Regulation was published on July 17, 2008 in Official Gazette No. 26939. According to the EIA regulation, projects should either submit an Environmental Impact Assessment (EIA) Report or Project Description Report (PDR) based on the classification of the projects listed in Annex I and Annex II of the EIA regulation. Since, the EIA process for Balıkesir-1 WFP was initiated in 2007, the Project was subject to the EIA Regulation. According to the Regulation, wind farms, regardless of their installed capacity, are included in Annex II. Hence, a PDR was prepared and submitted to the Balıkesir Provincial Directorate of Environment and Forestry. The Balıkesir PDoEF reviewed the PDR and issued an “EIA not Required” decision for the proposed Project on November 29, 2007.

It should be noted that according to latest amendment to the EIA Regulation published in Official Gazette No. 27980 dated June 30, 2011, wind farms with 75 MWe or more capacity is included in Annex I and subject to prepare an EIA Report, whereas wind power plants with 10 MWe or more capacity is included in Annex II and subject to prepare a PDR. Hence, new wind power plants having capacity of 75 MWe and more are subject to submit an EIA Report to the Ministry of Environment and Urbanization.

According to the EIA Regulation, transmission lines having a capacity of 154 kV or higher and a length of 5 km or higher are included in Annex II of the Regulation. Since, the transmission line to be constructed in the scope of the Balıkesir-1 WFP will have a capacity of 154 kV and a length of 4.5 km, the transmission line project is not required for an EIA Report. Enerjisa has applied to the Turkish Electricity Transmission Company (TEIAS) for confirming exemption of the transmission line from EIA Regulation. TEIAS confirmed the exemption of the transmission line from the EIA process in its Official Letter dated June 9, 2010.

### **2.4 Environmental Permitting**

The “EIA is not Required” for the projects 10MW-75MW or “EIA Positive Certificate” for projects above 75MW is the first environmental permit required prior to the construction of the project. One of the major environmental permits that wind power plants are subject to is Operations Permit since wind power plants are considered as Class II non-hygienic establishment (Listed in the Clause 1.4 of Annex 2B) in Regulation Related to Workplace Opening and Operation Permits. Hence, the facility should initiate Operations Permit process during the commissioning stage.

## 3.0 Proposed Project

### 3.1 Proposed Technology

General Electric (GE) 2.75 – 103 wind turbines with an 85 m hub height and a rotor diameter of 103 m will be used in the proposed Project. Each turbine has an installed capacity of 2.75 MW. Balıkesir-1 WFP will generate 142.5 GWh electrical energy annually on the average with these turbines.

The minimum wind speed for the turbine to operate is approximately 3 m/s at hub height and will be shut down in the rare event that the wind speeds at the site exceed 25 m/s to prevent damage to the turbine components. The rotor swept area of the turbines is 8,332 m<sup>2</sup> and each turbine will have 3 rotor blades.

It is planned that electricity will be transmitted from turbines to the switchyard by underground cable systems and transferred to the national electricity network via an overhead ETL. Basic components of the proposed wind farm will be as following:

- 85 m high towers and 2.75 MW turbines and generator blocks (52 turbines);
- Step-up Transformer;
- Switchyard;
  - Transformer
  - Control Room
  - Administrative Unit
  - Social Unit
- Protection Equipment;
- Control Equipments;
- Cables and associated equipment; and
- Energy transmission poles to connect switchboard area with national electricity network in Poyraz – Balıkesir Transformer II.

### 3.2 Proposed Location

The proposed power plant will be located in Central and Kepsut Districts of Balıkesir Province. The province lies in the western part of Turkey and borders with the Marmara Sea at the north, Çanakkale Province and the Aegean Sea at the west, Bursa and Kütahya Provinces at the east, İzmir and Manisa Provinces at the south. The distance of the project area from Balıkesir city center is nearly 12 km.

The proposed project location in Turkey is shown in Figure 3-1. The turbine locations and the villages nearby the Project site are presented in Figure 3-2 and Figure 3-3.



Figure 3-1 Location of Balıkesir-1 WFP in Turkey

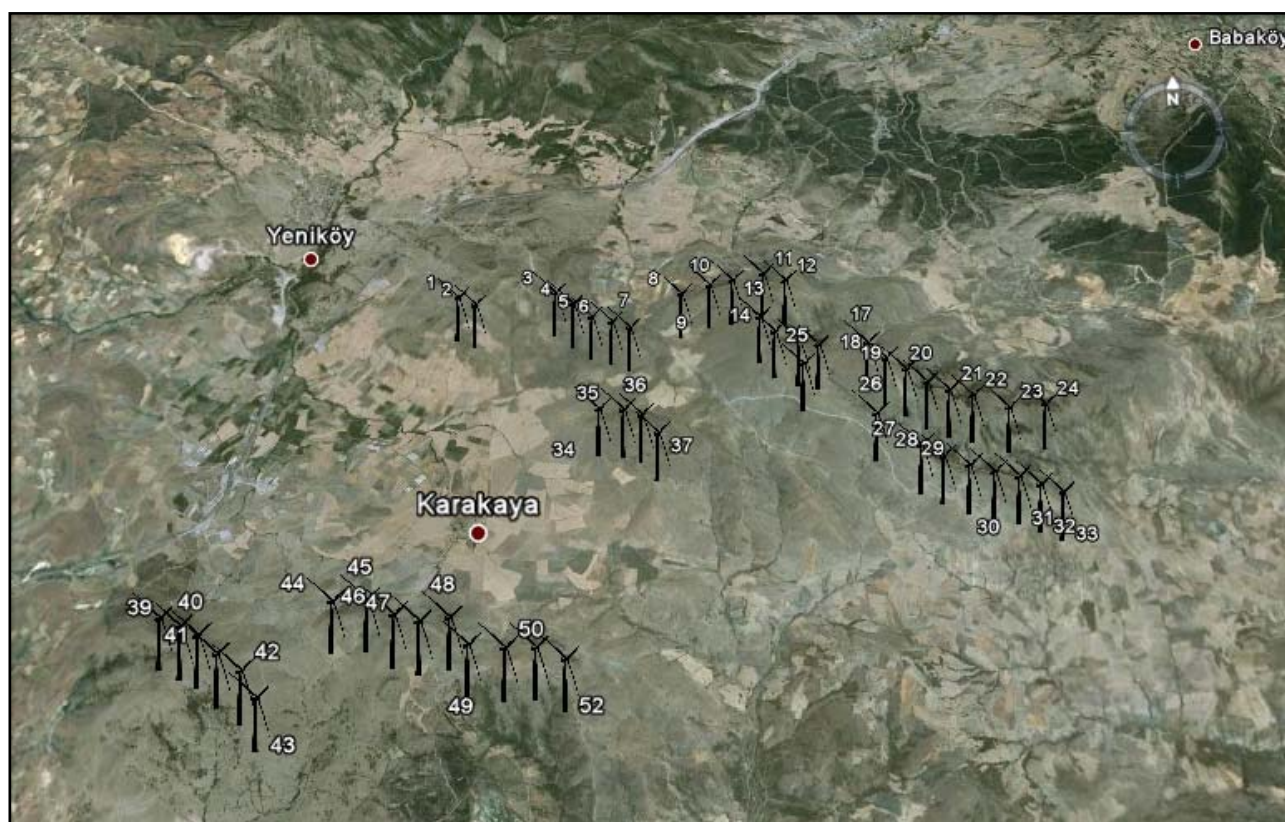


Figure 3-2 Turbine Locations of Balıkesir-1 WFP



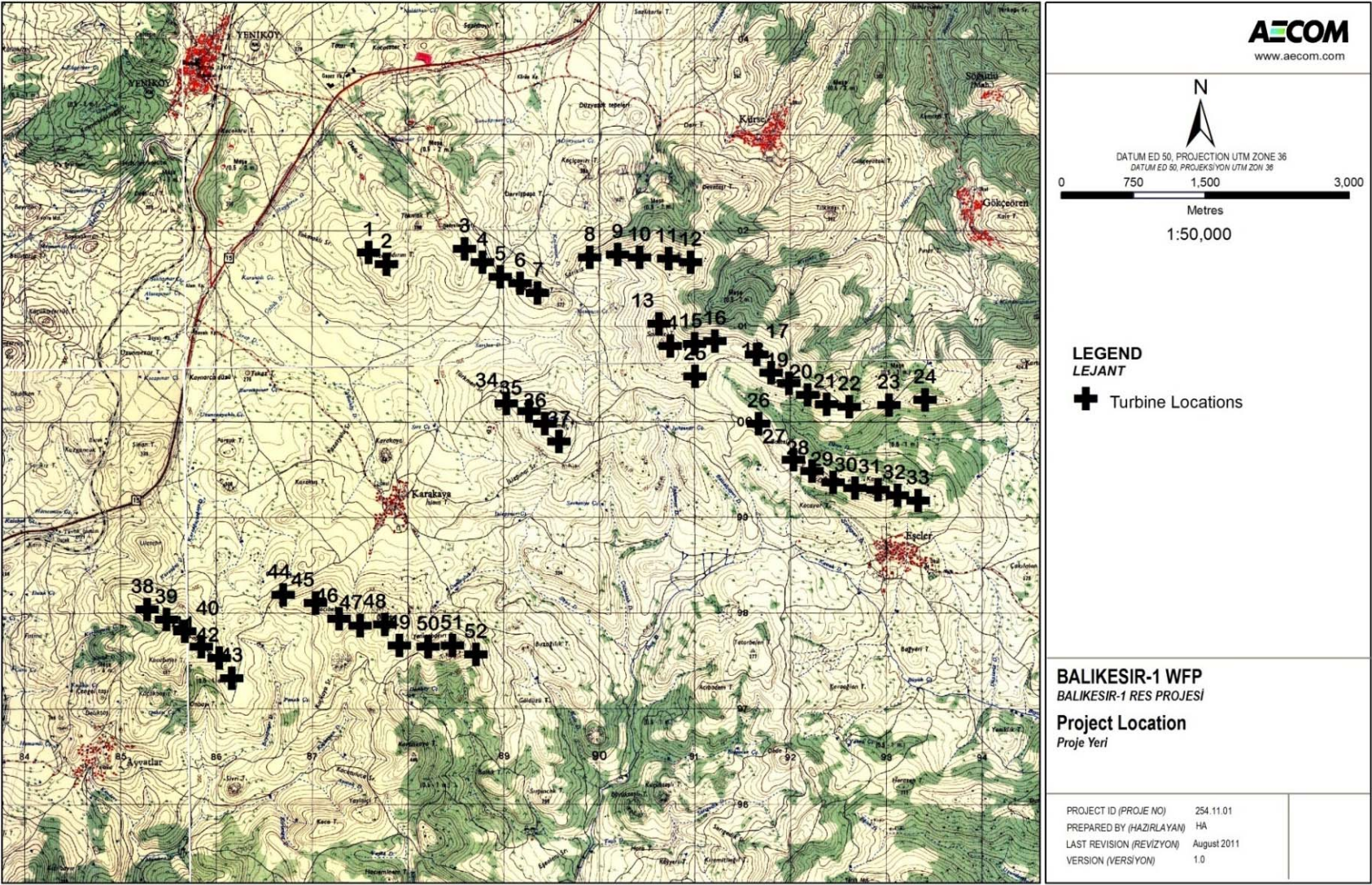


Figure 3-3 Turbine and Village Locations

Settlements located in close vicinity to the Project site are Yeniköy (1,730 m), Kürse (1,400 m), Gökçeören (1,750 m), Armutlu (2,300 m), Eşeler (403 m), Karakaya (1,130 m) and Ayvatlar (1,450 m) villages. The value given in parenthesis is the distance between the village and the closet turbine. Among these settlements, Eşeler Village is the closest residential area to the proposed Project site and thus it might be affected the most from the project's potential impacts during construction and operation phases.

The area that will be used for the wind farm will be 275,610 m<sup>2</sup> and access roads will cover 283,390 m<sup>2</sup> of land. Total area for the proposed Project will be 559,000 m<sup>2</sup>. Among these 67.3% of the project site is a pasture land, 10.9% is privately owned lands, 10% is forestry lands and 11.8% is unregistered lands. All permits and legal procedures related to the landuse are secured and completed for the Project.

The electricity generated in the project will be connected to the ETL of Poyraz WFP - Balıkesir Transformer Station II with a 154 kV capacity, 2x1272 MCM, 4,552 m long over head ETL. The ETL is proposed to start from the switchyard, as shown in Figure 3-4, and ends with a connection to the ETL of Poyraz WFP-Balıkesir Transformer Station II. The closest residential area to the overhead line is Karakaya Village, which is nearly 1 km west to the switchyard and the starting point of the ETL. Another close residential area is Eşeler Village which is located nearly 1.8 km northeast to the ETL.

There are several wind farm projects in operation or in planning stage in Balıkesir Province as shown in Figure 3-5. According to information obtained from EMRA, there are four licensed wind farm projects in the vicinity of the proposed Project site. These projects are Poyraz, Susurluk, Şamlı and Keltepe wind farms. The closest wind farm project to the proposed Project site is Poyraz wind farm (54.9MW) having 900 kW, 61 turbines. Poyraz wind farm is situated in the east of the proposed Project site. Although Poyraz wind farm had obtained its electricity generation license from EMRA in April 2007, the project is still in the planning phase. The second closest wind farm project to the proposed Project site is Susurluk Wind Farm with 23 turbines (45MW) which is in operation. Susurluk WF is located approximately 3.8 km away in north of the proposed Project site. Şamlı Wind Farm (90MW) and Keltepe Wind Farm (20.7MW) are both in operation and situated in the northeast and north of the proposed Project site, respectively. Şamlı Wind Farm has 30 turbines and it is approximately 18.5 km away from the proposed Project site. Keltepe Wind Farm, which has 23 turbines, and has a distance of approximately 21.5 km from the proposed Project site.

Potential cumulative impacts associated with the other wind farms in the region are evaluated during the environmental and social impact assessment study.



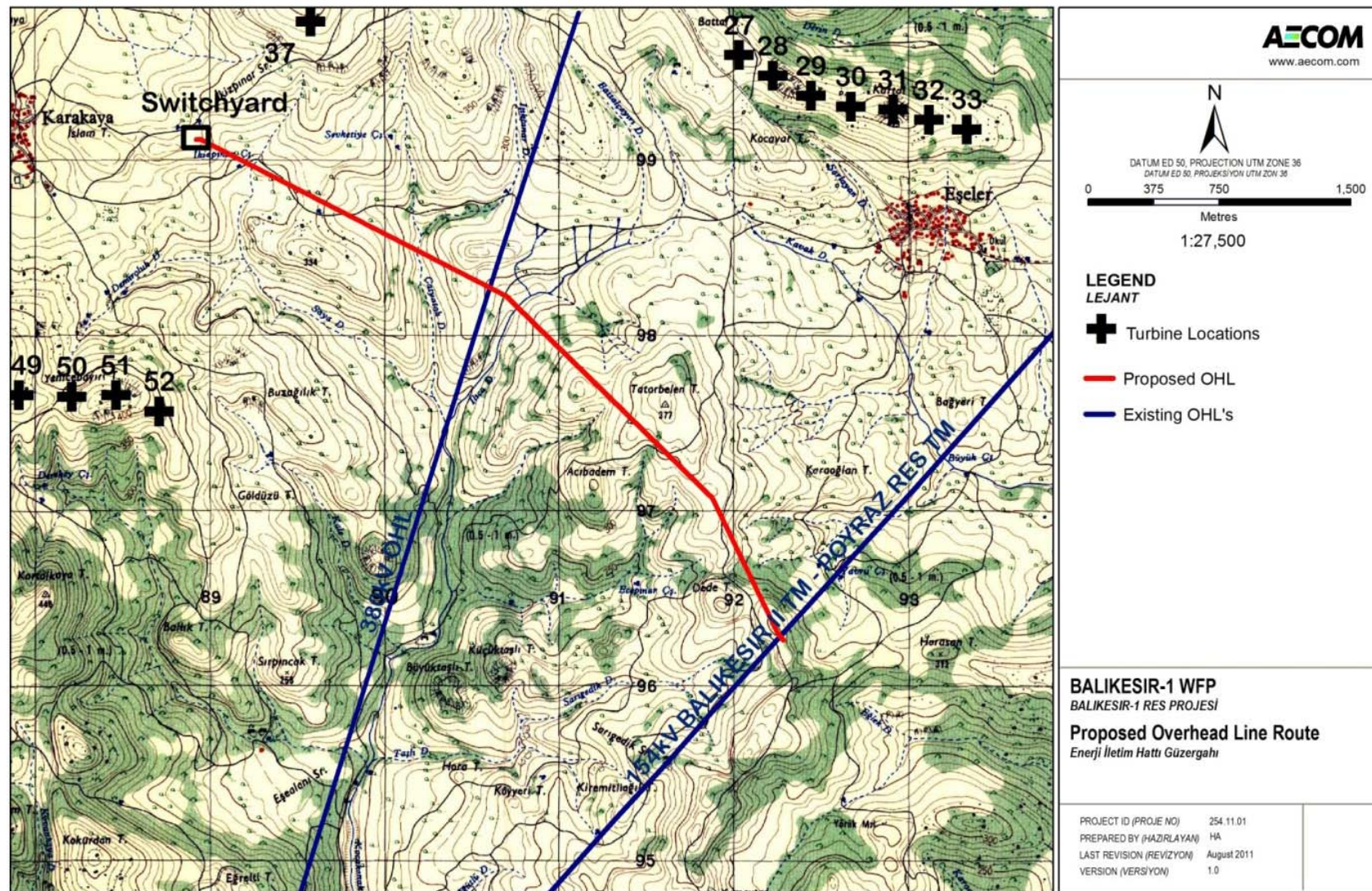


Figure 3-4 Switchyard Location and Energy Transmission Line Route of Balıkesir-1 WFP



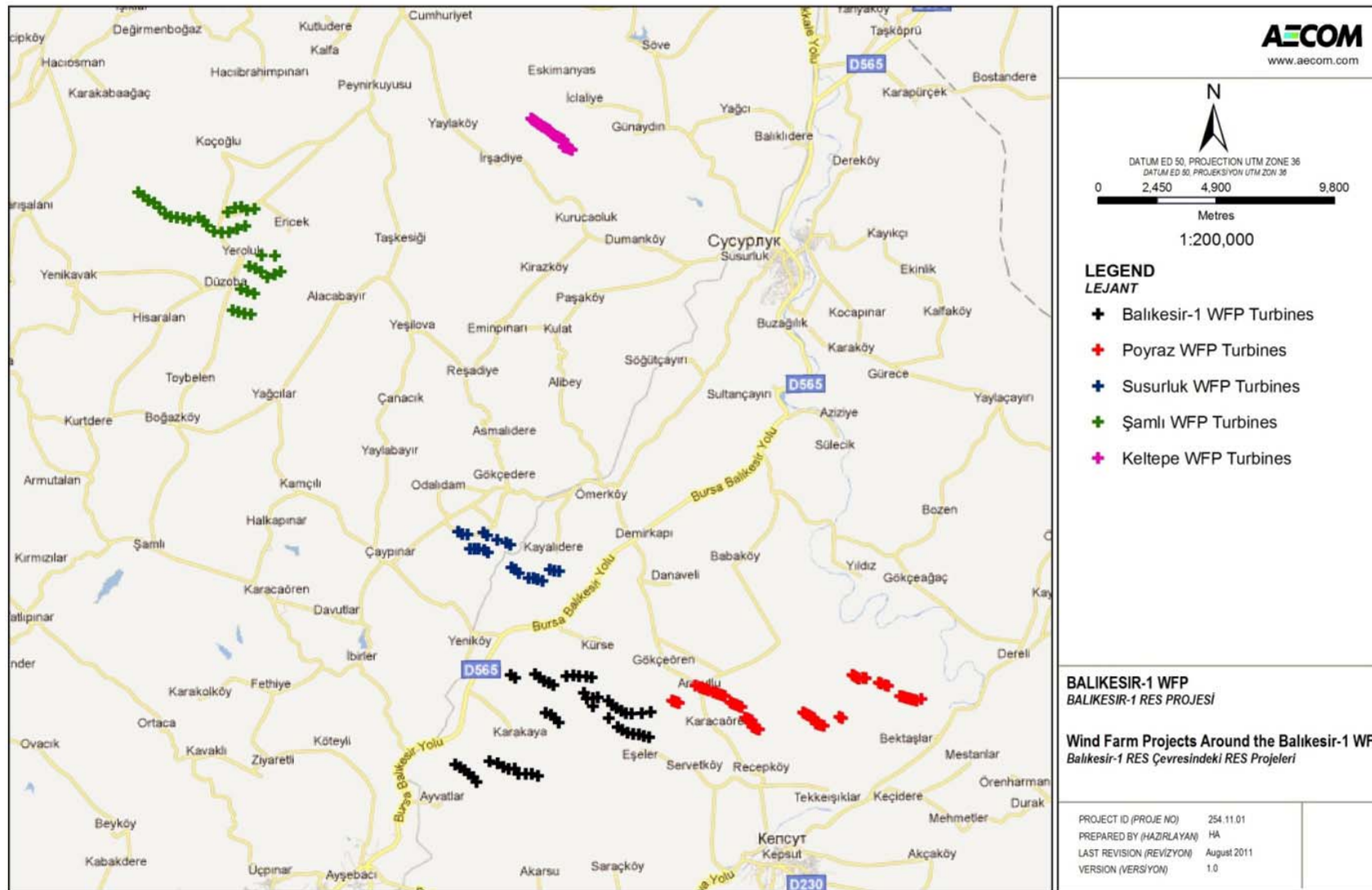


Figure 3-5 Wind Farm Projects around the Proposed Project

## **4.0 Existing Environment**

### **4.1 Climate**

Balıkesir has a Mediterranean climate with long, hot and dry summers with cool and rainy winters. According to long-term meteorological data recorded by the Balıkesir meteorological station, the annual average temperature is 14.5 °C. The maximum precipitation occurs during March. No flooding or drought was recorded at the region in 2007. According to results of sunshine duration surveys, annual daily sunshine average in Balıkesir is 6.5 hours.

### **4.2 Air Quality**

Within the ESIA study, a baseline air quality survey was conducted for PM<sub>10</sub> in Eşeler, Karakaya and Ayvatlar Villages. The results revealed that the ambient PM<sub>10</sub> concentrations were below the regulatory limits. In addition, for the SO<sub>2</sub> parameter, measurement results of Balıkesir Air Quality Measurement Station (operated by the Ministry of Environment and Forestry) were reviewed. These results are also in compliance with the regulatory limits.

### **4.3 Geology and Seismicity**

According to the General Geology Map of North/West Anatolian Region, andesites belonging to Neogene series are dominant at the proposed Project site. Project area consists of mainly three formations: Paleozoic aged marble (Pzmr) formation; Cretaceous aged Plateau Mélange (Ky) and; Neogene aged Volcanic Rocks (Na). All turbine locations, buildings and switchyard structures lay in the volcanic rocks of Neogene.

A geotechnical survey has been conducted at the project site. According to the results of this survey, main rock formation is composed of andesite, agglomerate and tuff with varying degrees of weathering. In addition, the study showed that there was no groundwater within 17 m depth from the ground.

The project site is situated at 1<sup>st</sup> degree earthquake risk zone. According to the Active Faults Map of Turkey, the active faults that may affect the survey area are Manyas, Edincik, Yenice-Gönen and Sarköy faults. Since the project area is located at the 1<sup>st</sup> degree earthquake zone, the buildings and other structures will be designed to be built in accordance with the earthquake regulation.

### **4.4 Surface Waters**

There is no surface water at the project site. It should be noted that there are two artificial lakes, one is located approximately 2 km south-east of T-51 and the other one is located approximately 4 km north of T11. There are no seas and natural lakes in the close proximity of the project site. The closest natural lakes are Kuş Lake, which is located nearly 44 km north of the project site, and Uluabat Lake located nearly 60 km northeast of the Project site.

#### 4.5 Land Use

Total Project site (including turbine locations and access roads) covers an area of 559,000 m<sup>2</sup>. The Project site consists of forestry land (10%), pasture land (67.3%), private land (10.9%) and unregistered public land (11.8%). Since, the Project site partially consists of private lands, these lands are expropriated. All permits and legal procedures related to the land acquisition are secured and completed for the project.

#### 4.6 Forests

The Project site is dominated by the steppe type vegetation with low intensity trees and shrubs. Therefore, limited number of trees will be cut down within the project. About 10% of the Project site is forestry land and the forestry permit for the Project site is secured.

#### 4.7 Agricultural and Pasture Lands

There are privately owned agricultural areas and pasture lands (owned by the Treasury) where the turbines will be erected, access roads and the ETL will pass through. Although most of the project affected areas are pasture lands, small number of agricultural areas in Ayvatlar Village will be affected by the proposed access road construction and few agricultural lands in Karakaya and Eşeler villages will be affected because of the overhead ETL construction. Therefore, project related affected agricultural areas will be limited. Mostly dry farming (no irrigation) is carried out on these agricultural areas.

All privately owned areas are acquired and all permits for the pasture lands are secured for the Project.

#### 4.8 Flora and Fauna

During environmental baseline study, a flora and fauna survey was conducted by a biologist at different time periods. One study was conducted between February and April, whereas the other study was performed during July and August. Duration of the study was one week. In addition, existing literature was also reviewed to determine potential species in the proposed Project site.

According to the vegetation map provided by General Directorate of Forestry, major tree species in the Project site is *Pinus nigra* (European Black Pine). According to the site survey and inventory study, 124 species were determined at the Project site and 9 of these species were endemic, vulnerable and threatened. However, these species have a widespread distribution throughout Turkey - especially in the western provinces of Turkey - according to the official website of Turkish Plants Data Service (TUBİVES).

In the scope of the site survey and literature survey performed, amphibian, reptile, mammal and bird species that area likely be present at the Project site were determined. All determined species were classified as Least Concern (LC) category according to International Union for Conservation of Nature (IUCN ) Red List.

As a result of these studies, there are no threatened or endangered flora and fauna species within the Project site.

## **4.9 Protected Areas**

There are no national parks, nature parks, wetlands, natural monuments, nature protection areas, wildlife protection and development areas, cultural assets, natural assets, biogenetic reserve areas, biosphere reserves, special environmental protection regions, tourism regions and other areas under protection within the Project site and its vicinity.

The closest protected area is Kuş Lake (Manyas Lake) which is located approximately 44 km north of the Project site. Kuş Lake, which is a wetland and a national park according to the Turkish legislation, is an Important Bird Areas (IBA) and a Ramsar Site (designated as Wetland of International Importance under the Ramsar Convention). This area is an important site for breeding and wintering of water birds. The assessment concerning this area is carried out within the ornithological study.

## **4.10 Noise**

Baseline noise monitoring study was carried out at 4 potential locations on December 4, 2009. These locations were selected for their distance to the receptors. One of the locations was in Eşeler Village, two of them were in Karakaya Village and one was in Ayvatlar Village. According to the measurement results, baseline equivalent noise levels (Leq) in all locations were in between 40.3 dBA and 42.8 dBA.

## **4.11 Socio-Economy**

### **4.11.1 Economic Environment**

Major economic activities in Balıkesir Province are agriculture and industry. The industry is the main economic sector in Balıkesir with about 51% share. There are about 600 large scale industrial facilities registered and operating in the province. The province has 4 organized industrial zones. The industrial development in Balıkesir depends on agricultural activities.

Other major economic activity is agriculture with a share of 49%. Around 56.7% of the employed population is working in agriculture sector. Main agricultural products are cereals, sesame, poppy seed, sunflower, tobacco, sugar beet and cotton. The total area used for agriculture is about 510,456 ha. The province is ranked number three in Turkey for the agricultural production.

According to the social impact assessment survey, main economic activities within the project affected settlements are agriculture and animal husbandry. Surveys indicate that most of those households are classified as living in poverty and do not have additional income like retirement salary or such.

### **4.11.2 Socio Environment**

The proposed wind farm will be located in Central and Kepsut Districts of Balıkesir Province. There are 19 districts of Balıkesir Province including the Central district. Total population of Balıkesir Province is 1,152,323 people according to the population census of 2010. While urban population of Balıkesir Province is 694,926, the rural population is 457,397. The population density is 75 people/km<sup>2</sup> in the province. Central and Kepsut Districts has populations of 334,893 and 25,574, respectively, according to population census of the Turkish Statistical Institute in 2010.

There are a total of 663 elementary schools, 27 high schools and 58 vocational high schools in Balıkesir Province. In addition, there are number of health institutions in the Central and Kepsut district such as hospitals, public health laboratories, family planning-mother child health centers and village clinics.

Unemployment rate is 10.2% in the city center and 10.1% in the districts. The rate is 2.1% for the villages. Unemployment rate for women (23%) is higher than the men (7.2%) in the urban areas (city center and district centers). On the other hand, this rate for women (1.1%) is lower than the men (3%) in the villages.

#### **4.12 Cultural Heritage**

There are no archaeological, historical and cultural assets within the project site. A “chance find” procedure will be developed to apply all excavation operations. If any archeological or historical artifacts are found during excavations for the project, the construction activity at that particular location will be stopped and the relevant government authorities will be informed immediately.

#### **4.13 Other Wind Farms**

The closest operating wind farm project to the proposed Project site is Susurluk WF, which is 45MW installed capacity with 23 turbines (22x2 MW and 1x1MW). Susurluk wind farm is visible from some locations of the Project site and located approximately 3.8 km to the north of the proposed Project site. The view of Susurluk Wind Farm from T13 location is shown Figure 4-1 and Figure 4-2. As discussed in Section 3.2, the other wind farms are either not in operation (i.e., Poyraz WF) or located in a significant distance to the proposed Project site (i.e., Şamlı WF and Keltepe WF).

The Project Description Reports for these wind farms were most likely prepared and submitted for an approval. During the public hearing of this project, none of the local participants mentioned negatively about these existing wind farms in the region.



**Figure 4-1 The View of Susurluk Wind Farm from the Proposed Project Site (from T13)**



**Figure 4-2 A Closer View of the Turbines from the Proposed Project Site (from T13)**



## **5.0 Impacts and Mitigation**

### **5.1 Soils, Geology, Seismicity and Hydrogeology**

The top soil on the turbine locations and locations of energy transmission line pylons will be stripped and stored to be used during landscaping the wind farm. The topsoil mainly generated from the excavation for the access roads, removed and stored near the switchyard area.

It is reported in the local environmental impact assessment report that there was no surface water or groundwater within 17 m below ground level according to geotechnical study conducted at the Project site. Since the hazardous materials and wastes will be stored and handled according to the local regulations, potential impact to groundwater is not expected to occur during construction and operation.

The ground properties of the Project site have been examined in the geotechnical survey. This survey results will be taken into consideration during the construction of plant units and structures.

The proposed Project is located in the 1<sup>st</sup> degree earthquake zone and thus the required safety measures and criteria were taken during the design of the proposed wind farm.

### **5.2 Air Quality**

Dust will be generated during civil works during the construction phase. Various construction vehicles and machines will also result in mobile source emissions such as SO<sub>2</sub>, NO<sub>x</sub>, CO and PM. The Environmental and Social Plan (ESAP) for Balıkesir-1 WFP lists a number of mitigation measures for dust and mobile emissions control. Considering the mitigation measures and the short duration of the activity, no adverse and permanent impacts on air quality are anticipated during the construction activities of the proposed Project.

### **5.3 Water and Wastewater**

Water will be mainly used for the construction works and domestic usage. The total water demand for the construction of wind turbines, switchyard and energy transmission lines is estimated to be 13.5 m<sup>3</sup> per day, whereas the operation period water demand is estimated to be as 2.25 m<sup>3</sup> per day.

During construction and operation periods, a leak-proof septic basin will be used for the collection of domestic wastewater since there is no municipal sewer system in the vicinity of the Project site. Wastewater collected in the septic tank will be disposed of in accordance with Water Pollution Control Regulation. Hence, no adverse impact is anticipated due to wastewater generated in the scope of the Balıkesir-1 WFP.

### **5.4 Noise**

Construction inevitably creates some degree of noise emissions at locations in close vicinity of the construction activities. However, construction noise is temporary and transient in nature. The noise

levels generated by construction works would have the potential to impact on noise sensitive receptors.

During the impact assessment study, six noise sensitive receptors (NSR) are identified as shown in Figure 5-1. The closest dwelling to turbine locations is located in Eşeler Village. The distance between the NSR and the closest turbine (T31) at where construction activities will be performed is about 403 m. The noise levels generated during the construction activities were calculated and the noise levels at different distances were determined in the PDR of the proposed Project. The noise levels generated from the construction activities decreases to 65.97 dBA in 250 meters. Therefore, the noise levels at the NSR during the construction periods will be in compliance with the Turkish RAMEN construction period noise limit of 70 dBA. In addition to the regulatory compliance demonstrated above, construction noise is temporary and transient in nature and can be controlled through good site working practices, limiting construction hours and adopting noise control measures where necessary. Thus, noise impact associated with the construction activities is not expected to be a significant issue for the proposed Project.

A quantitative noise impact assessment was performed by using noise modeling and predicted noise levels at the nearest sensitive receptors caused by the operation of the turbines. A background noise level monitoring study was performed at four different locations on December 4, 2009. The monitoring locations were situated at Eşeler Village, Karakaya Village and Ayvatlar Village which are the closest settlements to the Project site.

The predicted turbine noise levels at each NSR are below the absolute noise criteria of Turkish RAMEN for daytime, eveningtime and nighttime. Regarding the IFC/World Bank noise criteria, all NSR's except NSR-1 (the closest dwelling at Eşeler Village) complies with the noise limits of both daytime and nighttime periods. For the cases in which predicted noise level exceeds the absolute noise limit, the background noise levels become the determining parameter since the difference between the predicted noise level and the background noise level is taken into consideration. Therefore, a more detailed and realistic methodology will be used for the noise impact assessment at NSR-1 such as ETSU-R-97 methodology and in the scope of the methodology, the concurrent measurement of both wind speed/direction and background noise levels will be conducted at the NSR-1 for at least 48 hours. The background noise monitoring study will cover both daytime and nighttime periods and background noise levels of these two periods will be assessed separately.

Noise levels during decommissioning are expected to be similar to the noise levels during construction. Decommissioning noise will be temporary and transient in nature and like the construction activities, it can be controlled through good site working practices, limiting decommissioning hours and adopting noise control measures where and when necessary. Thus, noise impacts associated with the decommissioning activities are not expected to be a significant issue for the proposed Project.

The Environmental and Social Plan (ESAP) for Balıkesir-1 WFP lists a number of mitigation measures for noise control during construction and operation. Considering the mitigation measures no adverse impacts are anticipated during the construction and operation activities of the proposed project.

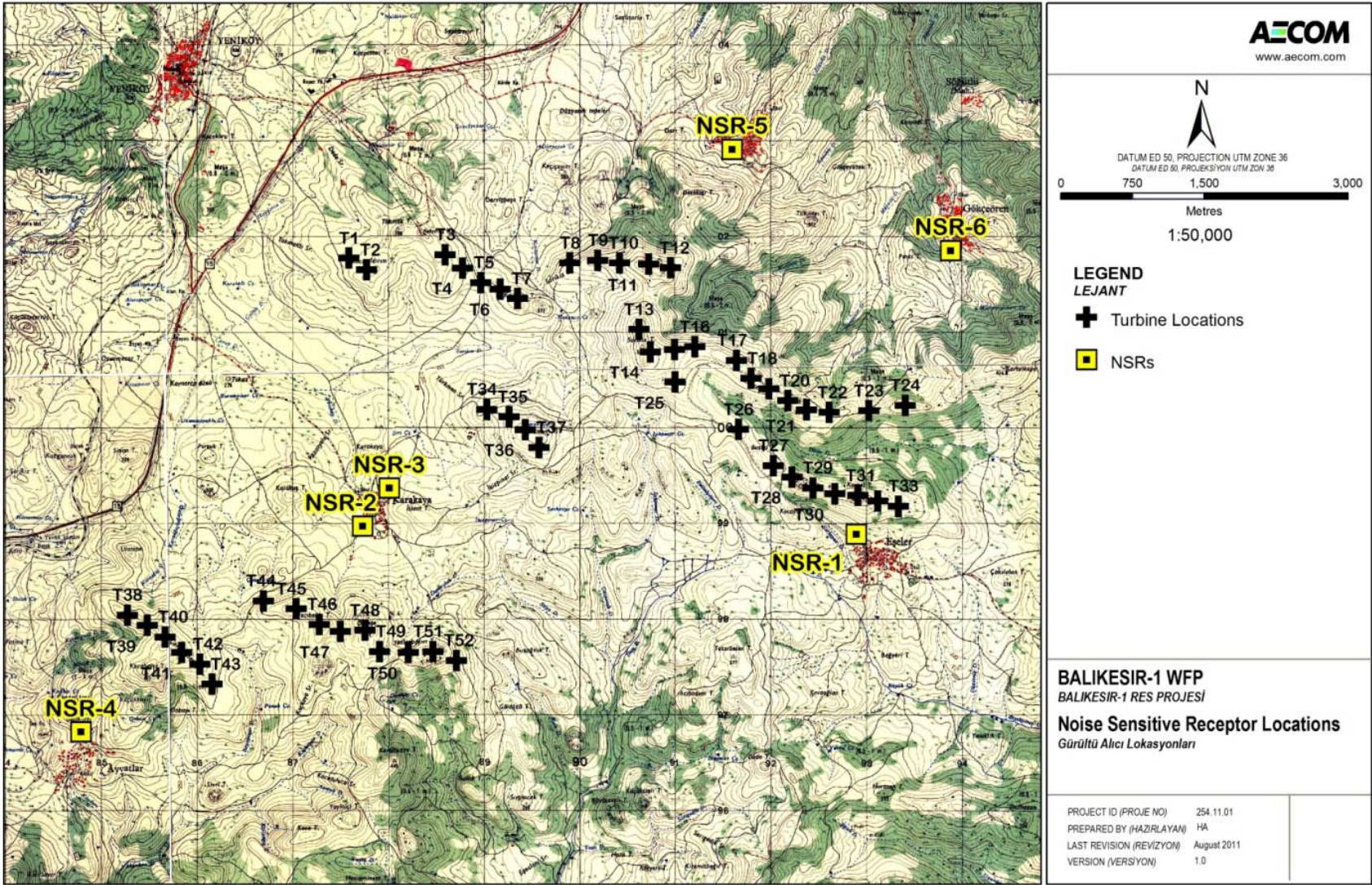


Figure 5-1 Noise Sensitive Receptors

## 5.5 Visual Impact

A detailed visual impact assessment was performed by using the final project layout and the turbine models having same dimensions with GE 2.75-103. In order to demonstrate the visual impact, views of the Project site from eight different locations have been prepared. Three dimensional wind turbine models are used in order to represent wind turbines that are planned to be used in the project, towers and blades and these models were overlaid onto photographs taken from the viewpoints using photomontage technique.

Eşeler is the closest village to the turbines and the potential visual impact is expected to be the most at Eşeler. Figure 5-2 shows the view of Turbines 30, 31, 32 and 33 from Eşeler Village that is situated about 940 m away from Turbine 32 at 250 m altitude.

The second view is from Karakaya Village located in the middle of the Project site and shown in Figure 5-3. The view is looking in south direction, 1,071 m away from Turbine at 300 m altitude.

Since the other villages are located more than 1,200 m from the project site, the view of the proposed project is less visible from the other villages.

The Project site is not located in a protected area or a tourist/resort area; it is located on a hilly topography and not considered as an aesthetically significant place. Thus, a visual impact is not considered as significant. However, the visual impact associated with the proposed wind farm will be permanent for those residing at the closest settlements.

The potential visual impact of the proposed wind farm will primarily result from changes to the visual character of the area within the view catchment. The nature of these changes will depend on the level of the visual contrast between turbine structures and the existing landscape within which they would be viewed. The degree of contrast between the turbines and the surrounding landscape will result from one or more of the visual characteristics such as; color, shape or scale, texture and reflectivity. Since the Project site has a hilly topography and the closest settlements are located at lower elevations, the turbines will be viewed against the sky.

Visual impact is a subjective issue, a significant number of people in Turkey associate wind farms with clean energy and view the towers as symbols of modern and civilized living. There is no known public opposition on wind farms in terms of potential visual effects. Moreover, there is a number of operating wind farms located in Balıkesir Province and one of these wind farm is located approximately 4 km north of the Project site. Therefore, residents of the settlements located in the vicinity of the Project site are familiar with wind farms and after the conversations with local people, it was understood that they do not have any disturbance or negative attitude about the visual impact of wind towers. Thus, it is expected that public and Non-governmental Organizations (NGOs) will view this development favorably and visual impacts will not considered being as significant.

Mitigation measures to ensure minimization of visual impacts are defined in the Environmental and Social Plan (ESAP) for Balıkesir-1 WFP.







	<b>Viewpoint Information</b>		<b>BALIKESİR WFP</b>	
	Viewpoint Coordinates	: 592959E 4398305N	Viewpoint 1 (Eşeler Village)	
	View Direction	: North		
	Viewpoint Elevation	: 250 m		
	Distance to Nearest Turbine	: 940 m (T32)		

Figure 5-2 View from Eşeler Village



	<b>Viewpoint Information</b>		<b>BALIKESİR WFP</b>	
	Viewpoint Coordinates	: 587712E 4398953N	Viewpoint 2 (South of Karakaya Village)	
	View Direction	: South		
	Viewpoint Elevation	: 300 m		
	Distance to Nearest Turbine	: 1071 m (T48)		

Figure 5-3 View from South of Karakaya Village

## **5.6 Shadow Flicker and Blade Glint**

A shadow modeling study is carried out in order to estimate the shadow casting areas. Shadow receptors, which are the closest permanent residences in the close vicinity of the Project Site, are determined.

The modeling result showed that a total of 2:24 hr/year, 1:27 hr/year and 0:28 hr/year shadow flickering would occur at shadow receptors in Karakaya Village, Ayvatlar Village and Kürse Village, respectively. The results of the shadow modeling shows that the duration of shadow flickering that will be observed at the nearest settlements can be considered as negligible and it can be stated that the proposed wind power plant will not cause significant shadow flickering impact on the closest settlements. In addition, blade glint is not expected to be an important issue since the blades will be made of and painted non reflective materials.

## **5.7 Waste**

Domestic waste will be produced during the construction and operation phases. Domestic solid waste will be transported to the disposal area of local Municipality. Recyclable waste such as paper, plastics, metal, etc. will also be produced during the construction and operation phases. These wastes will be collected separately and will be sent to the licensed recycling facilities.

Excavated soil will be re-used for the filling of the turbine foundation, location of energy transmission line pylons and site leveling purposes. Hence, no excavated soil will be transported and stored outside the Project site.

Small amounts of hazardous wastes will be generated during the proposed construction activity. Liquid hazardous wastes will be collected in leak-proof and safe containers stored in an area with a concrete surface and a proper secondary containment to prevent potential spills and leakages reaching to the soil and groundwater. Hazardous wastes will be sent to the licensed recover/disposal facilities by licensed transporters.

Thus, waste management activities are not expected to affect the environment adversely during the construction and operation period.

## **5.8 Hazardous Materials Management**

During the construction phase, no explosive or toxic materials will be used for the preparation of the site. Limited amounts of hazardous material will be used during the construction and operation phase of the proposed Project.

All chemical storage containers will be placed so as to minimize the risk of soil and groundwater contamination and water pollution. When necessary, spill kits, absorbent pads or materials, and absorbent sands will be provided near the chemical storage areas at all times. In addition, any spill from construction activities will be monitored and controlled; waste materials which are unsuitable for reuse on-site will be disposed of at an appropriately licensed waste disposal facility.



## 5.9 Impacts on Flora and Fauna

There are no sensitive or naturally protected areas within the project site. Although some flora species are reported as endemic and near threatened or vulnerable according to IUCN Red List in the flora inventory prepared during environmental baseline study, these species have a widespread distribution throughout Turkey - especially in the western provinces of Turkey - according to the official website of Turkish Plants Data Service (TUBİVES).

There will be impact on the existing vegetation during site preparation and excavation activities. However, vegetation loss will be limited and moreover, vegetative top soil of the Project site will be stripped prior to excavation works and will be stored in the construction site separately to be used in landscaping. Since, the Project site is dominantly covered by scrubs, minor tree cuttings will occur during construction activities. As a result the impact on vegetation is expected to be not significant during the construction.

According to the environmental baseline study, all amphibian, reptile, mammal and bird species determined in the vicinity of the Project site were classified as Least Concern (LC) category according to IUCN Red List.

### Ornithological Assessment

An ornithological assessment of the project site was conducted by an ornithologist, Stephen Dixon, of AECOM in order to identify and assess the project site in relation to potential adverse impacts on bird populations resulting from construction and operation of the proposed wind farm. An ornithological desk study report was prepared and presented in the Supplementary Information document.

The most likely impacts of wind farms on birds include collision mortality, disturbance and displacement of birds from regular feeding and breeding areas and barriers to the movement of migratory birds.

The assessment presented in the ornithological desk study report is based on a detailed desk study and literature review covering an area up to 50 km from the Project site in order to determine the presence and characteristics of sites designated for their ornithological interest (such as Important Bird Areas [IBAs] and Ramsar Sites), the presence of ecosystem and habitat features that might attract birds to the Project site and the wider surrounding area, the species of bird that might be at risk of interaction with the proposed turbines and their likely activity (such as migration or breeding) within and around the Project site. An initial site visit was also undertaken to the Project site in order to meet a representative of EBRD and to assess the habitat types and topographical features that could affect bird activity within and around the wind farm.

Based on this initial work there appears to be little risk of interaction between the proposed turbines and sensitive bird populations as the wind farm design and location fulfil the following key criteria:

- The Project site is not located within or close to an internationally or nationally protected site or an Important Bird Area. The nearest Ramsar site/IBA is Kuş Lake which is located 42 km to the north of the Project site;
- The Project site is not sited on a known migration bottle neck or major migration route;

- There are no wetland areas within or immediately adjacent to the Project site known to be of critical importance for water-bird populations. The Project site is not in a mountainous area and therefore there are no mountainous ridges or mountain passes.
- The Project site is outside the important steppic eco-region geographical area in central Turkey and therefore there will no impact on the internationally important bird assemblage that is a feature of this region of Turkey.

It is expected that the wind farm development will not have a significant negative effect upon migratory soaring birds and populations of water-birds. Furthermore the habitat types that occur within the Project site are not likely to be suitable for significant populations of bird species of national or global conservation concern. However, in order to provide a robust assessment of the likely impacts of the proposal on birds, these assertions should be tested through further survey work and post-construction monitoring surveys. Thus, recommendations within the ornithological desk study report have included a programme of autumn and spring migration Vantage Point (VP) surveys and suggestions for post-construction monitoring of bird mortalities, including carcass searches around the turbines. Thus, additional field study in September 2011 was undertaken to verify the data to date. Initial suggestions for mitigation are also presented in the ornithological desk study report.

## **5.10 Traffic**

The existing traffic infrastructure will not be affected significantly during construction due to both scale and short duration of the Project. However, a Traffic Management Plan will be prepared by the Project Owner and the EPC contractor prior to the construction phase of the proposed Project in order to eliminate this limited effect.

## **5.11 Socio-Economy**

During the local environmental review process, a social impact assessment study was conducted. This study included interviews with affected groups collectively or individually, questionnaires and public consultation/participation meetings. According to the questionnaire results, majority of the participants had positive attitude towards the project. The main issues that participant mentioned were accessibility to the remaining pasture lands in the vicinity of the turbines and electromagnetic effects of turbines. Sufficient distances were provided between turbines and electromagnetic effect would be limited since high technology and methodology would be implemented. On the other hand, all participants were in the opinion that the proposed Project would generate employment opportunities in the region during construction and operation periods.

As indicated previously, the Project site consists of forestry lands (10%), pasture lands (67.3%), private lands (10.9%) and unregistered public lands (11.8%). There is no resettlement within this project, only some privately owned lands are affected due to expropriation.

About 60 people will be employed during the construction phase, and about 15 employees will work during the operation phase. Since the Project generally requires specific technical knowledge; new labor opportunities for the local community will be limited.

There will be regional economic input as a result of commercial services (accommodation, consumption of food, clothing, transportation, etc.) that will be obtained from the local area by the employees.

### **5.12 Occupational Health and Safety**

An Emergency Action Plan will be prepared and implemented in the plant. All plant personnel will be trained for emergencies and they will take the required measures. An infirmary will be available at the plant during both construction and operation stages.

The Personnel Protective Equipment (PPE) use will be enforced and the necessary trainings will be provided to all personnel.

### **5.13 Community Health and Safety**

The main community health and safety issues related with this project were determined as lightning, aviation safety and public access to the remaining pasture lands.

The wind turbine will be equipped with lightning protection systems which have the task of diverting the lightning currents arising from lightning strikes and the energy associated with the lightning into the ground in a controlled manner. The turbine will be equipped with receptors, e.g. on the blades, that receive the lightning current and divert it through predefined paths within the turbine to the ground.

In case request of a local authority, anti-collision lighting and marking systems will be used on the blades in order to provide aviation safety.

In order to prevent entrance of un-authorized access to the Project site, farm area will be fenced. In addition, there will be two security personnel during the operation period.

### **5.14 Potential Impacts of ETL**

Since, the energy transmission line is located in the close vicinity of the Project site, similar environmental and social baseline conditions of the turbine areas are also observed along the ETL route. The project area is dominated by the steppe type vegetation with low intensity trees and shrubs. In addition, there are no sensitive or protected areas, threatened flora and fauna species within the Project site.

The ETL will pass through privately owned agricultural areas and pasture lands (owned by treasury). All privately owned areas are acquired and all permits for the pasture lands are secured for the ETL.

The main environmental impact of the ETL will be during the construction phase and will be habitat alteration due to land preparation and excavation for pylons. Since the ETL is relatively short (nearly 4.5 km) and the area to be used is not rich in terms of vegetation and no vulnerable or endangered species were determined in the close vicinity of the ETL route, potential environmental impact on existing vegetation will be limited. Similarly, a potential impact on fauna species will be limited due to the size of the proposed project.

The other potential impacts are also studied during the impact assessment. It is concluded all other potential impacts associated with ETL are not significant.

### **5.15 Cumulative Impacts**

A cumulative impact assessment was performed by taking the other projects into consideration in order to predict whether there will be any additional impacts at the nearest settlements associated with the other projects located around the proposed Project.

Among the cumulative impacts, noise is the most potential impact in this project. The cumulative impacts of the proposed Project and the projects mentioned above are evaluated based on the distances between each project. Since the proposed Project is far away from Susurluk, Şamlı and Keltepe Wind Farms, it can be stated that there will be no additional impact on the settlements around each existing project. However, Poyraz Wind Farm is situated in the close vicinity of the proposed Project site and Gökçeören Village is located between these two projects. Therefore, a quantitative cumulative noise impact assessment was performed in order to estimate whether the cumulative noise levels at Gökçeören Village comply with both the Turkish RAMEN limits and IFC/WB Guidelines.

The results revealed that the calculated cumulative noise level at Gökçeören Village caused by the operation of Poyraz Wind Farm and the proposed Project will be in compliance with both Turkish RAMEN and IFC/WB Guideline and thus the cumulative noise impact at Gökçeören Village will be negligible.

## 6.0 Environmental and Social Management

A comprehensive Environmental and Social Action Plan (ESAP) is prepared to monitor the potential impacts and implementation of mitigation measures during the construction, operation and decommissioning periods of the Project.

During the construction few potential impacts will be mitigated and monitored. The most important issues are Landscaping/Erosion, Waste Management and Ecology. During construction, the following major mitigation measures will be implemented:

- An Erosion and Sedimentation Control Plan will be prepared.
- Vegetative top soil of the project site will be stripped prior to excavation works and will be stored in the construction site separately to be used in landscaping.
- Slope stabilization and landscape works will be performed where excavation is carried out.
- A Waste Management Plan will be developed in order to reduce the waste generation and to implement the waste reuse and recycle practices.
- Sanitary (domestic) wastewater from the workers camp will be stored in sealed or impervious septic tanks.
- Wastewater generated during the construction phase will be transported and disposed periodically to relevant authority.
- All chemical storage containers, including diesel fuel, and hazardous liquid waste drums/containers will be placed so as to minimize the risk of soil and groundwater contamination and water pollution.
- Visual controls will be carried out before stripping and excavation works and the fauna elements inhabiting these areas will be removed by means of proper methods.
- Ornithological survey studies will be conducted to identify the population of the bird species, define the potential migration routes if there is any along the project site and related potential risks.
- Off road driving will be avoided as much as possible.
- Construction camp site and the equipment lay down area will be reinstated to original after the construction.
- Safety and traffic signs will be clearly placed near and around the project site on the road to the project site.
- Road safety training and adherence to speed limits will be stressed to all drivers.

The most important issues during the operation will be noise, ecology, community health and safety and visual. During operation, the following major mitigation measures will be implemented:

- The turbines with reduced noise operation system will be chosen in order to minimize noise emissions.
- The turbines will be equipped with optional noise reduced power operation modes to accommodate noise restrictions.
- Necessary noise reducing equipments and implementations will be provided (i.e. double wall windows and frames to the houses close to the turbines).

- Monitoring of the environmental noise at the nearest sensitive receptors during operation phase (if required).
- Waste oils resulting from maintenance works will be collected. These wastes will be removed from the project site in accordance with the Waste Oil Control Regulation.
- Off road driving will be avoided.
- Bird surveys will be conducted during the operation of the project during migration periods according to the results of the ornithological assessment before the operation.
- Turbines will be painted a uniform color, typically matching the sky (white, light gray or pale blue).
- A grievance mechanism will be developed to receive and manage complaints from project affected people.

## 7.0 Public Consultation and Disclosure

A Project Description Report (PDR) was prepared by a local consulting firm and submitted to the Balıkesir Provincial Directorate of Environment and Forestry. The project secured “Environmental EIA not Required” decision on November 29, 2007, which was a development consent. Local meetings and a socio-economic survey were also conducted for the Project. This study included interviews with affected groups collectively or individually, questionnaires and public consultation/participation meetings. A preliminary assessment was carried out to assess the number of properties that may be affected by the Project at each settlement. Settlements were selected according to the amount of expropriation or land acquisition needed and proximity to the Project site. As a result, small scale meetings with the affected groups were held in Ayvatlar, Eşeler, Gökçeören, Karakaya, Kürse and Yeniköy villages near the Project site. Private lands only in Ayvatlar Village were subject to land acquisition due to the Project.

At these meetings, the Project and the associated construction and operation activities were explained to the public and questions, opinions, comments and concerns of the public related to the project were gathered. With these activities, the Project completed sufficient public consultation prior to the construction.

There was no representative of the governmental institutions since these meetings were not conducted as the requirement of Turkish EIA regulation. However, during the evaluation period of the PDR, a number of provincial government offices were contacted and the Project received their approvals or consents. The Project has sufficiently disclosed the project to the government agencies and the general public with these activities.

During the construction phase, the local Governors Office and the headmen of the villages surrounding the Project will be provided with the work schedule for the project construction. If they request it, a schedule may be posted in a prominent place in the communities. In addition, there will be signs along the access roadsides to the Project area. In this way, people can be aware of when construction activities will take place and the nature of these activities. If there are to be significant impacts, such as road blockages or other disturbances, this will be communicated as well. If there are major changes in the schedule, this will also be communicated with the surrounding communities.

Local community will also be informed at key stages in the project cycle, such as before construction commences and prior to start-up of operations.

In the scope of the proposed project, a public grievance mechanism will be established and implemented in order to ensure that complaints of the project affected people are considered and resolved with corrective actions in a timely manner.

The printed version (hard copy) of the report will be provided to the headmen (mukhtar) of Eşeler Village, Kürse Village, Karakaya Village and Yeniköy Village. Also the report will be provided by the contact person of the project, Mr. Halit ILGAR, who will be based on the project site. The contact information of the site contact, Mr. Halit ILGAR, is given below for the local people or headman



offices to call in case of any problems, nuisance claims or contractors not adhering to the work plan or code of conduct. The contact details and the procedures will be explained and delivered in a meeting with each council prior to the start of construction.

The reports will be also available to the public at the website given below.

[www.enerjisa.com.tr](http://www.enerjisa.com.tr)

For any issues, stakeholders can reach to the following contacts:

**Mr. Halit ILGAR**

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or

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## REFERENCES

- Gençyılmaz, N., Varol, Gülçin. Türkiye Elektrik Enerjisi, 10 Yıllık Üretim Kapasite Projeksiyonu (2009-2018). Türkiye Elektrik Dağıtım AS, APK Dairesi Başkanlığı, Türkiye 11. Enerji Kongresi ve Sergisi, 21-23 October, 2009, İzmir.
- Turkish Electricity Transmission Company, 2010. 10 Years Capacity Projection of the Energy Production in Turkey (2010 – 2019).
- Turkish Wind Power Association (TWPA), Website of TWPA,  
<[http://www.ruzgarenerjisibirliqi.org.tr/index.php?option=com\\_docman&task=cat\\_view&qid=57&Itemid=69](http://www.ruzgarenerjisibirliqi.org.tr/index.php?option=com_docman&task=cat_view&qid=57&Itemid=69)>