



Monitoring report form for CDM project activity
(Version 07.0)

MONITORING REPORT

Title of the project activity	Silivri Wind Power Plant, Turkey	
UNFCCC reference number of the project activity	GS 4264	
Version number of the PDD applicable to this monitoring report	4	
Version number of this monitoring report	0 ~~5~~ ⁴	
Completion date of this monitoring report	1 ~~5~~ ⁰ / ~~1~~ ¹ ~~0~~ ⁹ /2019	
Monitoring period number	2	
Duration of this monitoring period	01/04/2017-31/07/2019	
Monitoring report number for this monitoring period	1	
Project participants	Silivri Enerji A.Ş.	
Host Party	Turkey	
Applied methodologies and standardized baselines	ACM0002: Grid-connected electricity generation from renewable sources - Version. 16.0.0	
Sectoral scopes	Energy industries (renewable - / non-renewable sources)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
		219,613
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	187,771	

SECTION A. Description of project activity

A.1. General description of project activity

“Silivri Wind Power Plant, Turkey” was constructed by “Silivri Enerji A.Ş.” in Istanbul province, North West of Turkey. The generation license of the project was issued in 29/04/2013 for 49 years. The project's registered installed capacity is 45 MW and annual generation is estimated to be 143,327 MWh. The annual emission reduction estimated by the project is 80,442 tonnes of CO₂eq.

There are eighteen Nordex N100 turbines, each having a capacity of 2.5 MWs. The electricity is transmitted to substation Silivri TM, 154 kV.

The purpose of the project is to produce renewable electricity using wind as the power source and to contribute to Turkey's growing electricity demand through a sustainable and low carbon technology. The project will displace the same amount of electricity generated by the grid dominated with fossil fired power plants.

Construction work started in 21/10/2013, and operation of the plant started on 20/08/2014. The implementation of the 1st phase (10 wind turbines) was on 20/08/2014, the 2nd phase (5 wind turbines) was on 04/09/2014 and the 3rd phase (3 wind turbines) was on 19/09/2014.

Even the installed capacity of the project in the generation license was 57.5 MW, the capacity of 45 MW has been in operation during the 1st monitoring period. Two turbines (T22 and T23) were added to the project on 11/01/2019 and they started their commercial operation.¹ Finally, the generation license of the project was revised on 31/03/2017 and the installed capacity of the project has been raised to 60 MWm/45MWe with the revision. Two turbines (T19 and T20) have been constructed, however their commissioning has not been realized, yet. In addition to this, the construction of one turbine (T11) is going on. As the registered capacity (45MW) of the project is considered, the electricity generation and the emission reduction of the added units are ignored for this monitoring period.

The project has produced positive environmental and economic benefits through the following aspects:

- Displacing the electricity generated by fossil fuel fired power plants by utilising the renewable resources so as to avoid environmental pollution and GHG emissions,
- Contributing the economic development of the region by providing sustainable energy resources,
- Increasing the income and local standard of living by providing job opportunities for the local people.
- Reducing the blackout because of low voltage by lowering required capacity of the transformer.

Total electricity generation and emission reduction in this monitoring period has been calculated as 391,328.06 MWh and 219,613tCO₂eq, respectively.

A.2. Location of project activity

The project site is located about 20 km northeast of Silivri District in Istanbul, Turkey and is situated on several hills, between Fenerköy and Gazitepe Village. The closest settlement is Gazitepe-Fenerköy village by 2.2 km². The turbine towers were built in a 5 km long strip placed approximately 300-400 m apart.

¹ Commissioning protocol of the turbines are available to the DOE.

² Please see the image, “Nearest Settlement” and the Google Earth file, “Turbine Locations”.

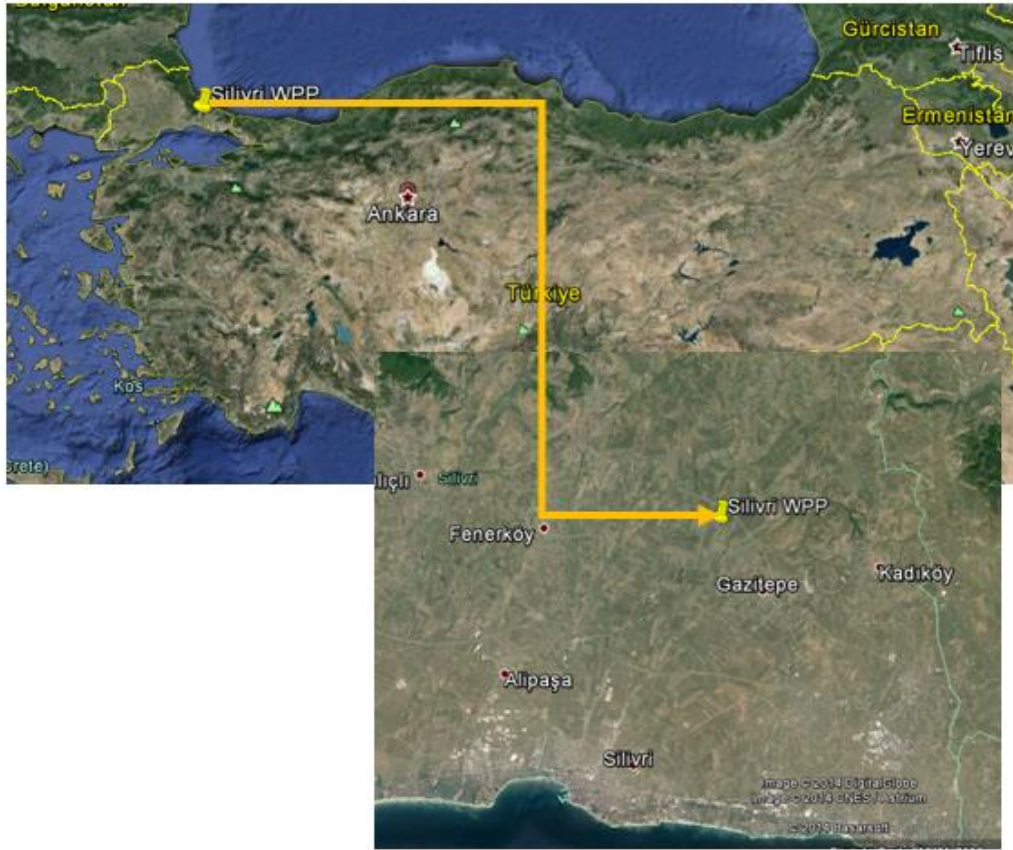


Figure 1. The Project Area

The coordinates of the project (including the added capacity) may be seen in Table 1:

Table 1- Project Coordinates³

	E	N		E	N
T1	605548,00	4558615,00	T13	609453,00	4556492,00
T2	605852,00	4558547,00	T14	609656,00	4556351,00
T3	606149,00	4558497,00	T15	609975,00	4556294,00
T4	607107,00	4558488,00	T16	610864,00	4556658,00
T5	607162,00	4558260,00	T17	611135,00	4556743,00
T6	608090,00	4558480,00	T18	611401,00	4556637,00
T7	608143,00	4558081,00		E	N
T8	608283,00	4557875,00	T19	604726,31	4558643,78
T9	608466,00	4557695,00	T20	605060,00	4558638,00
T10	608413,00	4556774,00	T21	606979,00	4558900,00
T11	606536,00	4558618,00	T22	607180,00	4559539,00
T12	609324,00	4556776,00	T23	607951,00	4559013,00

The construction of the turbines, T19 and T20, have been completed, however their commissioning has not been realized. Additionally, the construction of T11 is also going on.

³ The Generation License including the coordinates is available to the DOE.

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Turkey (host Party)	Silivri Enerji A.Ş.	No

A.4. References to applied methodologies and standardized baselines

The emission reductions of the Project have been calculated in accordance with the approved small scale CDM-methodology ACM0002: Grid-connected electricity generation from renewable sources - Version. 16.0.0.

For baseline calculations the ACM0002: refers to;

1. Tool to calculate the emission factor for an electricity system (Version 04.0.0)⁴
2. Tool for the demonstration and assessment of additionality (Version 07.0.0)⁵
3. Combined tool to identify the baseline scenario and demonstrate additionality (Version 05.0.0)⁶
4. Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion (Version 02.0.0)⁷
5. Tool to determine the remaining lifetime of the equipment⁸

For baseline calculation the first tool, for additionality assessment the second tool is used. As third tool is the combination of the first and second tool, it is not used. Since no project emission or leakage calculation is required for wind power project fourth tool is not used, and finally to determine the remaining lifetime of the equipment fifth tool is used.

A.5. Crediting period type and duration

20/08/2014-19/08/2021

The first crediting period is 7 years and renewable twice

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

The project is implemented as defined in Section A.1 above. "Silivri Wind Power Plant, Turkey has 45 MW installed capacity with eighteen Nordex N100 turbines, each having a capacity of 2.5 MWs. The electricity is transmitted to substation Silivri TM, 154 kV.

The key parameters about the technical design of the selected model Nordex N100 2.5MW turbines are listed below in Table 2:

⁴ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v4.0.pdf>

⁵ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>

⁶ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v5.0.0.pdf>

⁷ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf>

⁸ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-10-v1.pdf>

Table 2- Technical specifications of Nordex N100 2.5MW

Specifications	Nordex N100 2.5 MW
Rated Power (kW)	2500
Rotor Diameter (m)	99.8
Blade Length (m)	58
Num. of Blades	3
Swept Area (m ²)	7823
Cut-out wind speed (m/s)	25

The project was operational on 20/08/2014 and registered on 30/05/2016 under the Gold Standard Registry with the registration number GS 4264.

Even the installed capacity of the project in the generation license was 57.5 MW, the capacity of 45 MW has been in operation during the 1st monitoring period. Two turbines (T22 and T23) were added to the project on 11/01/2019 and they started their commercial operation.⁹ Additionally, the generation license of the project was revised on 31/03/2017. The installed capacity of the project has been raised to 60 MW with the revision. Two turbines (T19 and T20) have been constructed), however their commissioning has not been realized. Additionally, the construction of one turbine (T11) is also going on. Since the registered capacity of the project (45 MWe) is considered, the electricity generation and the emission reduction of the added units are ignored for this monitoring period. No design change process has been initiated, yet.

The project timeline is given in the table below:

Table 3- Project Timeline

Date	Activity
11/06/2009	"EIA is not required" certificate
06/01/2012	Agreement with Carbon consultant
03/02/2012	Silivri Wind Data Analysis and Energy Production Generation Assessment Report
29/04/2013	Issuance of the License
15/03/2013	Agreement with Equipment provider
29/03/2013	Loan Proposal Date
21/10/2013	Date for start of construction
20/08/2014	1st phased implementation of the 10 wind turbines.
20/08/2014	Start date of operation
20/08/2014	Start date of first verification period
20/08/2014	Crediting period start date
04/09/2014	2nd phased implementation of the 5 wind turbines.
19/09/2014	3rd phased implementation of the 3 wind turbines.
30/05/2016	Date of project registration
31/03/2017	End date of first verification period
01/04/2017	Start date of second monitoring period
31/03/2017	Revision of the generation license (increase to installed capacity of 60 MW)
11/01/2019	Commissioning of 2 turbines (T22 and T23)
31/07/2019	End date of second monitoring period

⁹ Commissioning protocol of tow turbines are available to the DOE.

B.2. Post-registration changes**B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents**

N/A

B.2.2. Corrections

N/A

B.2.3. Changes to the start date of the crediting period

N/A

B.2.4. Inclusion of monitoring plan

N/A

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

Silivri Wind Power Plant, Turkey was registered as Voluntary Emission Reduction under Gold Standard scheme on 30/05/2016. Even the installed capacity of the project in the generation license was 57.5 MW, the capacity of 45 MW has been in operation during the 1st monitoring period. Two turbines were added to the project on 11/01/2019 and started to commercial operation on 01/02/2019. Additionally, the generation license of the project was revised on 31/03/2017. The installed capacity of the project has been raised to 60 MW with the revision. As the registered capacity of the project is considered, the electricity generation and the emission reduction of the added units will be ignored.

During this period, the project contributed to decreased fossil fuel consumption as well as a more sustainable development by generating 404,670.33MWh and thus the reduction of 227,100.99tonnes of CO₂eq. These values represent the generation and emission reduction of the power plant including also the capacity increase. For the aim of reaching the actual values derived from the registered capacity, the generation of the added turbines taken from SCADA system¹⁰ of the project activity will be subtracted from the total generated amount which could be monitored through EPIAS records. Thus, baseline emissions will be based on the adjusted net electricity supplied to the grid. The adjusted net electricity is 391,328.06MWh and the baseline emissions total to 219,613tonnes of CO₂eq for this monitoring period.

The 'adjusted net electricity supplied to the grid' is calculated as below:

¹⁰ SCADA screenshot are available to the DOE.

Adjusted net electricity supplied to the grid = $EG_{PJ,y}$ - Generation of Added Capacity Taken From the SCADA System¹¹

Regarding the generation of two turbines (T22 and T23) which were added on 11/01/2019, the calculation method below is used for the subtraction of January 2019 generation. The reason is that the scada does not show the generation amount of 21 days.

Adjusted net electricity supplied to the grid = $EG_{PJ,y} - (EG_{PJ,y} \times \text{Expected Generation of Added Capacity/Expected Generation after Capacity Increase})$ ¹²

Considering the net electricity exported to the grid, EPIAS records are used as the main source rather than the Meter Reading Forms. The reason is that the Meter Reading Forms were issued by the governmental officers and signed by both parties. Currently, the forms are filled by the project owner and approved by the governmental officers. Additionally, the remote reading by the governmental body is also available. Since the system has changed, EPIAS records are preferred as the main source by the DOE.

B.2.6. Changes to project design

Two turbines were added to the project activity on 11/01/2019 and the installed capacity of the project has been raised to 51 MW. Finally, the generation license of the project was revised on 31/03/2017 and the generation capacity of the project has been raised to 60 MWm/45MWe with the revision.

B.2.7. Changes specific to afforestation or reforestation project activity

N/A

SECTION C. Description of monitoring system

The objective of the monitoring plan is to ensure the complete, consistent, clear, and accurate monitoring and calculation of the emissions reductions during the whole crediting period. The Project Owner is responsible for the implementation of the monitoring plan.

Monitoring Organization and System

The Project Owner is responsible for the overall management of the monitoring procedures including recording, data collection, calculating emission reductions and project emissions.

Please see below the management structure for the plant operation:

¹¹ The calculation may be seen through the Baseline Emissions sheet of ER calculations file.

¹² The adjustment has been done upon the total electricity generation instead of the net electricity supplied to the grid. The whole electricity withdrawn from the grid has been subtracted from the adjusted electricity generation to reach adjusted net electricity supplied.

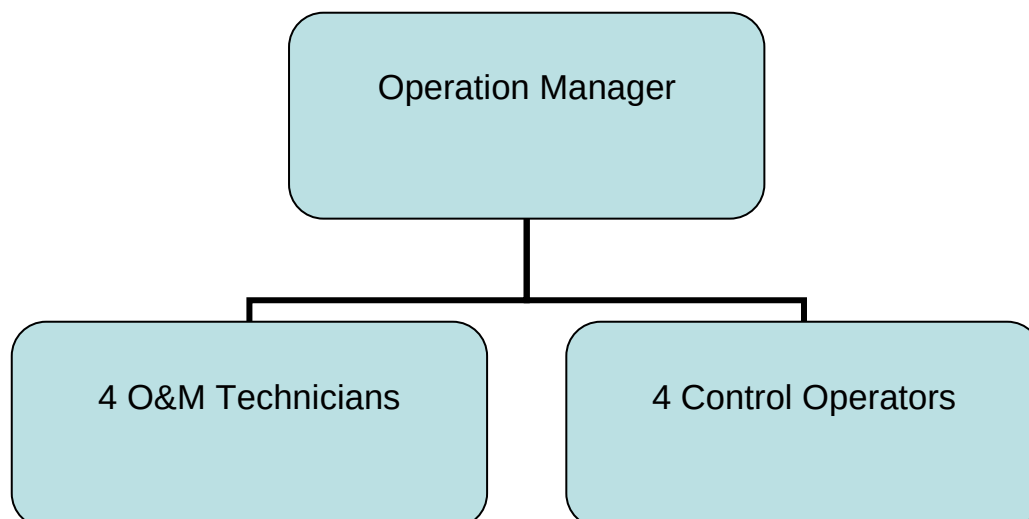


Figure 2. The management structure for the plant operation

TEIAS is performing remote reading of the meters and monthly power meter readings are the basis for monitoring net electricity fed into the grid. A measuring protocol is prepared including day, peak and night hour electricity generation by the project owner and approved by governmental officers at the end of each month.¹³

EPIAS¹⁴ records are the main source for the quantity of the net electricity. EPIAS is the financial settlement centre of TEIAS (the national grid operator). The website of EPIAS is accessible to Project owner with their unique user ID and password. Once accessed, the Project owner is able to call electricity generation and consumption reports of their own projects. The same reports are used by the Project owner for invoicing TEIAS. The electricity generation data is reported monthly basis. The EPIAS records are crosschecked with the meter reading forms.

Moreover, there are always internal reviews of the meters data which is checked by different parties. First of all, data of the meters is collected by technicians daily in written forms. The data collected daily is saved in plant manager computer and backed up and shared by headquarter of the Project owner in Istanbul. Besides the data that can be get from meters, production amount can be checked from SCADA system of Nordex.

The electricity is transmitted to substation Silivri TM, 154 kV. The single line diagram of Silivri Wind Power Plant, Turkey is provided below:

¹³ The monthly reading protocols are available to the DOE.

¹⁴ PMUM has been replaced by EPIAS as of 01/09/2015 in Turkey during the verification period. Retrospective data is accessible via EPIAS.

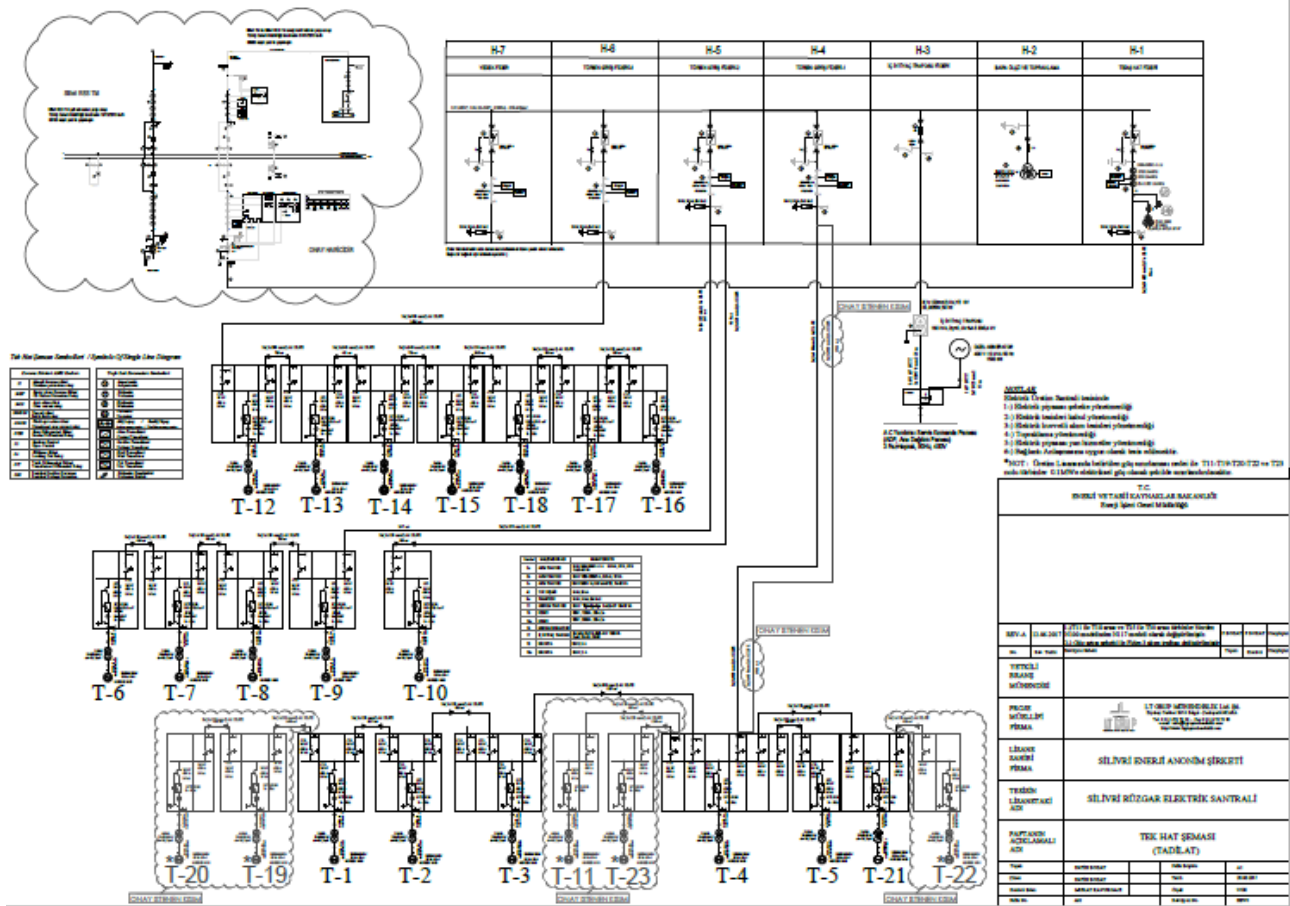


Figure 3. The Single Line Diagram of Silivri Wind Power Plant, Turkey

Monitoring parameters

According to the methodology applied, the electricity supplied to the national grid by the project and the electricity consumed by the project activity shall be monitored. The net electricity is the difference of the electricity supplied and consumed by the project and shall be taken into account for emission reduction calculations.

Data Management and Quality Control

Two power meters are installed at the grid interface of the project. One is the main meter and the other is back-up meter of the main meter for cross-checking. Both meters are jointly inspected and sealed in order to be protected from interference by any of the parties. The data is hourly recorded by the personnel on the plant. There is a logbook for the purpose.

The capacity of the transmission line connected is 154 kVA, the accuracy class for main power meter has been defined in the Communiqué for Power Meters as 0.2S class. The back-up meter has the same accuracy class of 0.2S. The calibration will be implemented in accordance with the related standard procedures (IEC-EN 60687) by either TEİAŞ or the provider company in the name of TEİAŞ. TEİAŞ conducts remote reading. And operative manager, employee of Silivri, conducts reading from the project site and sends to TEİAŞ. By this way, a cross-check is done. Also, with the readings from project site, continuously these two meters are compared with each other and if any differences are detected the necessary control measures are taken. Both power meters are

EMH model, 0.2S class. The serial number for main power meter is 4241393 and the back-up power meter is 4241394.

As the measuring devices are sealed by TEİAŞ, the Project Participant cannot intervene with the devices. In case of unforeseen problems or failures of the meters or if any differences occur between main and back-up devices TEİAŞ has to be informed for necessary maintenance and calibration. In case of a problem or failure of the meters TEİAŞ reacts as fast as possible to solve the problem.

The Project Participant will keep all the data needed for the calculation of emission reductions during the crediting period and until two years after the last issuance of GS VERs for the project activity.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	EG _{gross,y}
Unit	MWh
Description	Gross Electricity supplied to the grid by relevant sources (2011-2013)
Source of data	Turkish Electricity Transmission Company (TEİAŞ), Annual Development of Turkey's Gross Electricity Generation of Primary Energy Resources (2006 - 2013) TEİAS
Value(s) applied	Please see registered PDD (Table 15)
Choice of data or measurement methods and procedures	TEİAS is the national electricity transmission company, which makes available the official data of all power plants in Turkey.
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	-

Data/Parameter	EG _{net,y}
Unit	GWh
Description	Net electricity generated by all power plants connected to the national grid excluding low-cost must run power plants between years 2011-2013
Source of data	Turkish Electricity Transmission Company (TEİAŞ), Annual Development of Turkey's Gross Electricity Generation of Primary Energy Resources (2006 - 2013) TEİAS
Value(s) applied	Please see registered PDD (Table 16, Table 17)
Choice of data or measurement methods and procedures	This data is used to find relation between the gross and net electricity delivered to the grid by fossil fuel fired power plants. Import and Export data is used to identify total net electricity fed into the grid in the years of 2011, 2012 and 2013. TEİAS is the national electricity transmission company, which makes available the official data of all power plants in Turkey.
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	-

Data/Parameter	HV _{i,y}
Unit	Mass or volume unit

Description	Heating Values of fuels consumed for electricity generation in the years of 2011, 2012 and 2013
Source of data	Heating Values of fuels consumed for electricity generation in the years of 2011, 2012 and 2013 Source of data. Heating Values of Fuels Consumed In Thermal Power Plants in Turkey by The Electric Utilities, TEIAS. See: https://www.teias.gov.tr/tr/turkiye-elektrik-uretim-iletim-istatistikleri
Value(s) applied	Please see registered PDD (Table 22)
Choice of data or measurement methods and procedures	There is no national NVC data in Turkey. However, TEIAS announces Heating values of fuels. This data is used to calculate annual NCVs for each fuel type. TEIAS is the national electricity transmission company, which makes available the official data of all power plants in Turkey.
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	-

Data/Parameter	$FC_{i,y}$
Unit	Mass or volume unit
Description	Amount of fuel type i consumed in the project electricity system between years 2011-2013
Source of data	Annual Development of Fuels Consumed in Thermal Power Plants In Turkey By The Electric Utilities, TEIAS. https://www.teias.gov.tr/tr/turkiye-elektrik-uretim-iletim-istatistikleri
Value(s) applied	Please see registered PDD (Table 23)
Choice of data or measurement methods and procedures	TEIAS is the national electricity transmission company, which makes available the official data of all power plants in Turkey.
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	-

Data/Parameter	$NCV_{i,y}$
Unit	GJ/mass or volume unit
Description	Net Calorific Value of each fossil fuel type between the years 2011, 2012 and 2013
Source of data	Calculated by using $HV_{i,y}$ to $FC_{i,y}$ as Net Calorific Values of fuel types are not directly available in Turkey
Value(s) applied	Please see registered PDD (Table 24, 22, 23).
Choice of data or measurement methods and procedures	TEIAS is the national electricity transmission company, which makes available the official data of power plants in Turkey. Calculation of NCVs from national $HV_{i,y}$ and $FC_{i,y}$ data are preferred to default IPCC data as these are more reliable.
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	-

Data/Parameter	Sample Group for BM emission factor
Unit	Name of the plants, MW capacities, fuel types, annual electricity generations and dates of commissioning
Description	Most recent power plants which compromise %20 of total generation

Source of data	Annual Development of Fuels Consumed In Thermal Power Plants In Turkey By The Electric Utilities, TEIAS. The reports are now available through the website of EPDK: https://www.epdk.org.tr/Detay/Icerik/3-0-66/elektrikuretim-kapasite-projeksiyonlari
Value(s) applied	Please see registered PDD (Table 19)
Choice of data or measurement methods and procedures	TEIAS is the national electricity transmission company, which makes available the official data of all power plants in Turkey. The latest data available during PDD preparation was for 2012 please find information as: https://www.epdk.org.tr/Detay/Icerik/3-0-66/elektrikuretim-kapasite-projeksiyonlari
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	-

Data/Parameter	EF _{CO2 i, y}
Unit	tCO2/TJ
Description	CO ₂ emission factor of fossil fuel type i between years 2011-2013
Source of data	IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the IPCC Guidelines on National GHG Inventories. http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value(s) applied	Please see registered PDD (Table 20)
Choice of data or measurement methods and procedures	No plant specific and national emission factor data is available in Turkey. So, IPCC default data is used. For Fuel Oil Power Plants: 'Gas/Diesel Oil' data is used for conservativeness. For Coal Power Plants: In the 205th page of official document given in the link below, it is stated that Çolakoğlu and İçdaş utilizes 'Taşkömürü' (Hardcoal). And at the Table-2 in page 157 of the same document, Taşkömürü is divided in two groups: Bituminous and Anthracite. Since Sub-Bituminous Coal is under Brown Coal in the same table and since Other Bituminous Coal has lower EF than Anthracite in 1.4 of IPCC Guidelines, EF for 'Other Bituminous Coal' is used. See: http://www.dpt.gov.tr/DocObjects/Icerik/4225/Enerji_Hammaddeleri_(Linyit_Taskomuru-Jeotermal) .
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	-

Data/Parameter	$\eta_{m,y}$
Unit	-
Description	Average net energy conversion efficiency of thermal power units connected to the grid
Source of data	Annex I the "Tool to calculate the emission factor for an electricity system" (v.4)
Value(s) applied	Please see registered PDD (Table 20)

Choice of data or measurement methods and procedures	For efficiency rates of Coal and Lignite Power Plants See Annex-1 of the Tool (highest rate is applied to be conservative) For Natural Gas and Oil plants efficiencies, default value given in the tool is applied: http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.pdf
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	

Data/Parameter	EF _{grid,CM,y}
Unit	tCO ₂ /MWh
Description	Emission factor of the Turkish grid determined ex- ante. Calculated specific emission factors based on the carbon emission data and the electricity production of the grid
Source of data	Please see registered PDD
Value(s) applied	0.5612 tCO ₂ /MWh
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Data used for emission reduction calculation
Additional comments	-

D.2. Data and parameters monitored

Data/Parameter	EG _{facility, y}
Unit	MWh/yr
Description	Net electricity exported to the grid in the year y
Measured/calculated/default	Measured
Source of data	Electricity meter (s)
Value(s) of monitored parameter	110,813.82 MWh for 2017 184,280.89 MWh for 2018 96,233.35MWh for 2019 Net electricity exported is crosschecked with Meter Reading Forms issued by Project owner and approved by governmental officers (When the PDD was issued the system worked as: The Meter Reading Forms were issued by the governmental officers and signed by both parties. Currently, the forms are filled by the project owner and approved by the governmental officers. Additionally, the remote reading by the governmental body is also available). Since the system has changed EPIAS records are considered as the main source.

Monitoring equipment	The net electricity is measured continuously by an electricity meter at the grid interface and recorded monthly.		
	Electricity meters:		
		Main Meter	Back-up Meter
	Manufacturer	EMH	EMH
	Serial Number	4241393	4241394
	Date of Installation	08/08/2014	08/08/2014
	Latest Test Date of the Meters	10/07/2018	10/07/2018
Accuracy of meters			
Measuring/reading/recording frequency	~~Monthly readings~~ Continuous measurement and at least monthly recording		
Calculation method (if applicable)	The net electricity is the difference of the electricity supplied and consumed by the project and shall be taken into account for emission reduction calculations. For the aim of reaching the actual values derived from the registered capacity (45 MW), the generation of the added turbines taken from SCADA system of the project activity will be subtracted from the total generated amount which could be monitored through EPIAS records. Thus, baseline emissions will base on the adjusted net electricity supplied to the grid.		
QA/QC procedures	- Back-up meter is used for crosschecking the accuracy and both meters are calibrated if required. - EPIAS records are considered as the main source for the net electricity and the values are crosschecked with the data measured by meters. - TEIAS is responsible for calibration and maintenance of the devices. The periodical calibration or maintenance is under the responsibility of TEIAS and has been fixed as once in 10 years.¹⁵ Since TEIAS meters are sealed by TEIAS, the project proponent cannot intervene with the devices. The periodic tests are executed on annual basis. - Last two metering tests were performed on 05/07/2017 and 10/07/2018.¹⁶		
Purpose of data/parameter	Calculation of emission reductions		
Additional comments	-		

Sustainable Development Matrix Indicators

Data/Parameter	Air Quality (1)
Unit	tons
Description	Amount of annual net electricity generation, which is calculated by monthly EPIAS records, will be used to calculate estimated CO and NMVOC emission reductions by project activity.
Measured/calculated/default	Measured/Calculated

¹⁵ <http://www.mevzuat.gov.tr/Metin.Aspx?MevzuatKod=7.5.6381&MevzuatIliski=0&sourceXmlSearch>

¹⁶ Tests for 2016, 2017 and 2018 are available to the DOE.

Source of data	Data available from TUIK: http://www.tuik.gov.tr/PreHaberBultenleri.do?id=16174 Since the latest data of CO and NMVOC emissions from the electricity sector are available for the year 2012, the rate between the Net Electricity Generation in 2012 and CO and NMVOC emissions of 2012 have been used to calculate the emission reductions for this monitoring period. (Rates: CO: 0.160 tons and NMVOC: 0.034 tons per each GWh electricity generated)
Value(s) of monitored parameter	NMVOC =13.39 tons; CO=62.69.3 tons; ¹⁷
Monitoring equipment	Electricity meters
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Amount of annual net electricity generation, which is calculated by monthly EPIAS records, has been used to calculate estimated CO and NMVOC emission reductions by project activity.
QA/QC procedures	N/A
Purpose of data/parameter	Sustainability monitoring parameters
Additional comments	

Data/Parameter	Water Quality and Quantity (2)
Unit	m ³
Description	Amount of wastewater to be discharged to the environment Wastewater produced by workers during operation is collected in an impermeable septic tank and later they are periodically transferred to wastewater treatment plant.
Measured/calculated/default	Measured/Calculated
Source of data	-Data available from TUIK: http://www.tuik.gov.tr/PreHaberBultenleri.do?id=16175 The data for thermal power plants' wastewater indicators which were available during registration- (2012 by TUIK), have been used to calculate the avoided wastewater discharge to the environment per year during the monitoring period. -Regarding Total Electricity Generation for 2012, TEIAS official data have been used: https://www.teias.gov.tr/tr/turkiye-elektrik-uretim-iletim-istatistikleri/2012 -Records of transfer of wastewater from power plant by sewage truck, if it was performed, will be used to demonstrate proper wastewater management

¹⁷ Calculations for the amount of avoided NMVOC and CO have been shown in ER Calculations Silivri WPP excel spreadsheet.

Value(s) of monitored parameter	26.3 m3 wastewater is assumed to be discharged the environment due to each GWh electricity produced. Avoidance of around 10,298.3 m ³ wastewater discharge to the environment during this monitoring period. and this corresponds to 4,411.8 per year ¹⁸
Monitoring equipment	Electricity meters
Measuring/reading/recording frequency	Annually
Calculation method (if applicable)	Amount of annual net electricity generation, which is calculated by monthly EPIAS records, has been used to calculate the avoided wastewater discharge to the environment per year during the monitoring period.
QA/QC procedures	N/A
Purpose of data/parameter	Sustainability monitoring parameters
Additional comments	-

Data/Parameter	Quality of employment (3)
Unit	N/A
Description	Quality of employment is monitored through the job-related trainings and certificates given to the personnel.
Measured/calculated/default	N/A
Source of data	Certificates/Attendance Lists
Value(s) of monitored parameter	<u>8 (technical/project) personnel took trainings</u> Please see Annex I for the trainings provided ¹⁹
Monitoring equipment	N/A
Measuring/reading/recording frequency	Once for each monitoring period
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data/parameter	Sustainability monitoring parameters
Additional comments	-

Data/Parameter	Quantitative employment and income generation (4)
Unit	N/A
Description	Project participant gives priority to employees from local region. For number of local employees, Social Security System records are provided.
Measured/calculated/default	N/A
Source of data	Social Security System records ²⁰

¹⁸ Calculations for the amount of avoided wastewater have been shown in ER Calculations Silivri WPP excel spreadsheet.

¹⁹ The certificates and the attendance lists are available to the DOE.

Value(s) of monitored parameter	16 personnel are working for Silivri: • 1 Operation Manager • 3 O&M Technicians • 4 Control Operators • 4 Security Staff (Subcontractor-Akdeniz Security) • 3 Information Staff (Subcontractor-Akdeniz Management and Cleaning Services) • 1 O&M Technician (Nordex) 6 personnel are from local region.
Monitoring equipment	N/A
Measuring/reading/recording frequency	Each monitoring period
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data/parameter	Sustainability monitoring parameters
Additional comments	-

Data/Parameter	Biodiversity (6)
Unit	N/A
Description	Leaving approximately 300-400meter distance between turbines
Measured/calculated/default	N/A
Source of data	Generation license (turbine coordinates are shown)
Value(s) of monitored parameter	300-400meters
Monitoring equipment	N/A
Measuring/reading/recording frequency	Each monitoring period
Calculation method (if applicable)	N/A
QA/QC procedures	N/A
Purpose of data/parameter	Sustainability monitoring parameters
Additional comments	Layout plan demonstrated through Google Earth Pro is available to the DOE.

D.3. Implementation of sampling plan

N/A

²⁰ The records are available to the DOE.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

The baseline emission BE_y (tCO₂e) during the monitoring period results from:

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y}$$

Where:

BE_y	Baseline emissions in year y (tCO ₂ e/y)
$EG_{PJ,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{grid,CM,y}$	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated by using the latest version of the “Tool to calculate the emission factor for an electricity system” (tCO ₂ /MWh)

$EF_{grid,CM,y}$ value is fixed as 0.5612 tCO₂/MWh for the crediting period of seven years.

Since the registered capacity of the project activity is different from the installed capacity due to design change, the baseline emissions and thus emissions reductions will be based on the ‘adjusted net electricity supplied to the grid’. This value will be calculated as below:

Adjusted net electricity supplied to the grid = $EG_{PJ,y}$ - Generation of Added Capacity Taken From the SCADA System ²¹

Table 4 shows the baseline emissions for the verification period:

²¹ The calculation can be seen in more detail via the ER Calculations Silivri WPP excel spreadsheet which is available to the DOE.

Table 4- Baseline Emissions

Month	(A) Electricity supplied to the grid [MWh]	(B) Electricity consumption from the grid [MWh]	(C) = (A) - (B) EG (ID 8) Net electricity supplied to the grid [MWh]	EF [tCO ₂ /MWh]	Baseline emission: ER = EG * EF [t CO ₂ -eq]	Adjusted net electricity supplied to the grid [MWh] (E) = (D) - (B)	Adjusted baseline emission: ER = EG * EF [t CO ₂ -eq]
Apr-17	7.323,049	25,03	7.298,02	0,561	4.096	7.298	4.096
May-17	12.418,40	9,138	12.409,26	0,561	6.964	12.409	6.964
Jun-17	7.521,60	24,07	7.497,53	0,561	4.208	7.498	4.208
Jul-17	15.545,46	13,83	15.531,62	0,561	8.716	15.532	8.716
Aug-17	18.988,24	1,83	18.986,41	0,561	10.655	18.986	10.655
Sep-17	11.077,44	18,84	11.058,60	0,561	6.206	11.059	6.206
Oct-17	8.876,95	25,33	8.851,62	0,561	4.968	8.852	4.968
Nov-17	9.620,23	15,82	9.604,42	0,561	5.390	9.604	5.390
Dec-17	19.579,265	2,916	19.576,35	0,561	10.986	19.576	10.986
Jan-18	13.646,04	10,50	13.635,54	0,561	7.652	13.636	7.652
Feb-18	17.980,28	5,34	17.974,94	0,561	10.088	17.975	10.088
Mar-18	14.910,86	7,42	14.903,45	0,561	8.364	14.903	8.364
Apr-18	12.931,26	21,13	12.910,13	0,561	7.245	12.910	7.245
May-18	14.237,30	14,34	14.222,95	0,561	7.982	14.223	7.982
Jun-18	12.970,86	9,91	12.960,95	0,561	7.274	12.961	7.274
Jul-18	5.945,38	19,08	5.926,30	0,561	3.326	5.926	3.326
Aug-18	22.111,05	0,35	22.110,70	0,561	12.409	22.111	12.409
Sep-18	16.610,94	9,25	16.601,69	0,561	9.317	16.602	9.317
Oct-18	16.864,51	4,15	16.860,35	0,561	9.462	16.860	9.462
Nov-18	22.199,57	2,73	22.196,84	0,561	12.457	22.197	12.457
Dec-18	13.991,89	14,84	13.977,05	0,561	7.844	13.977	7.844
Jan-19	19.357,93	5,99	19.351,94	0,561	10.860	17.338	9.730
Feb-19	19.970,96	9,94	19.961,02	0,561	11.202	17.410	9.770
Mar-19	16.980,97	12,86	16.968,11	0,561	9.523	14.689	8.244
Apr-19	12.758,17	11,29	12.746,88	0,561	7.154	11.128	6.245
May-19	9.672,67	19,80	9.652,86	0,561	5.417	8.426	4.729
Jun-19	15.046,62	15,40	15.031,22	0,561	8.436	13.255	7.439
Jul-19	15.872,67	9,076	15.863,60	0,561	8.903	13.987	7.850
2017 Vintage (01.04.2017-31.12.2017)	110.950,63	136,81	110.813,82	5,05	62.188,72	110.813,82	62.189
2018 Vintage (01.01.2018-31.12.2018)	184.399,93	119,04	184.280,89	6,73	103.418,43	184.280,89	103.418
2019 Vintage (01.01.2019-31.07.2019)	109.659,98	84,35	109.575,62	3,93	61.493,84	96.233,35	54.006
Total	405.010,53	340,20	404.670,33	15,71	227.100,99	391.328,06	219.613

E.2. Calculation of project emissions or actual net removals

Project emissions are taken as zero as per the methodology

E.3. Calculation of leakage emissions

No leakage needs to be considered.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	219,613	0	0	0	219,613	219,613

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante for this monitoring period in the PDD (t CO ₂ e)
219,613	187,771

E.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the PDD”

Estimated emission reduction in ex ante calculation of registered PDD is 80,442 tCO₂e, which corresponds to 187,771 tCO₂e for 852 days. And actual emission reduction achieved during this monitoring period is 219,613tCO₂e (for 01/04/2017-31/07/2019, 852 days).²²

E.6. Remarks on increase in achieved emission reductions

Actual emission reduction in the second monitoring period is higher (31,842 tCO₂e) than the ex-ante value estimated in the registered PDD. The amount causing difference can be explained as the increase of 17% than the expected generation of the project activity. The actual ERs in vintage 2017-2019 is 3%, 29%, 16% respectively higher than the estimated ERs during the same period. It's obvious that the generation is volatile considering the differences between the years. The differences may occur due to more wind than expected. The vintage wise and total comparison may be seen in Table 5:

Table 5- Comparison of Emission Reductions

Vintage	Period	Amount achieved during this monitoring period (tCO ₂ e)	Amount estimated ex ante (tCO ₂ e)
2017	01.04.2017-31.12.2017	62.189	60.607
2018	01.01.2018-31.12.2018	103.418	80.442
2019	01.01.2019-31.07.2019	54.006	46.722
Total		219.613	187.771

²² The calculation can be seen in more detail via the ER Calculations Silivri WPP excel spreadsheet which is available to the DOE.

E.7. Remarks on scale of small-scale project activity

N/A

Annex I

Participant	Training	Date
Erkan Çelik	Turbine Operation	13.10.2017
İlyas Koçak	Turbine Operation	24.02.2017
Tarık Çetintaş	Turbine Operation	13.10.2017
Erkan Çelik	Setting Device	13.04.2017
İlyas Koçak	Setting Device	14.04.2017
Murat Sirel	Setting Device	15.04.2017
Osman Nuriş Çoraklı	Setting Device	16.04.2017
Taner Akkan	Setting Device	17.04.2017
Tarık Çetintaş	Setting Device	18.04.2017
Tarık Şamdanlı	Setting Device	19.04.2017
Erkan Çelik	Operation of the Lift	3.08.2017
İlyas Koçak	Operation of the Lift	4.08.2017
Taner Akkan	Operation of the Lift	9.08.2017
Tarık Çetintaş	Operation of the Lift	4.08.2017
Erkan Çelik	Technical Issues/Health and Safety	21.04.2018
Tarık Çetintaş	Technical Issues/Health and Safety	21.04.2018
İlyas Koçak	Technical Issues/Health and Safety	21.04.2018
Osman Nuriş Çoraklı	Technical Issues/Health and Safety	21.04.2018
Murat Sirel	Technical Issues/Health and Safety	21.04.2018
Tarık Şamdanlı	Technical Issues/Health and Safety	21.04.2018
Erkan Çelik	Health and Safety/1	20.04.2018
Tarık Çetintaş	Health and Safety/1	20.04.2018
İlyas Koçak	Health and Safety/1	20.04.2018
Osman Nuriş Çoraklı	Health and Safety/1	20.04.2018
Murat Sirel	Health and Safety/1	20.04.2018
Tarık Şamdanlı	Health and Safety/1	20.04.2018
Erkan Çelik	Health and Safety/2	20.04.2018
Tarık Şamdanlı	Health and Safety/2	20.04.2018
İlyas Koçak	Health and Safety/2	20.04.2018
Osman Nuriş Çoraklı	Health and Safety/2	20.04.2018
Murat Sirel	Health and Safety/2	20.04.2018
Tarık Şamdanlı	Health and Safety/2	20.04.2018
Erkan Çelik	Fire and State of Emergency	5.06.2018
Murat Sirel	Fire and State of Emergency	5.06.2018
Tarık Şamdanlı	Fire and State of Emergency	5.06.2018
Kerim Göksu	Fire and State of Emergency	5.06.2018
Taner Gürbüz	Fire and State of Emergency	5.06.2018
İlyas Koçak	Fire and State of Emergency	5.06.2018
Tarık Çetintaş	Fire and State of Emergency	5.06.2018
İlyas Koçak	Working at Height & Rescue	01.03.2018- 02.03.2018
Taner Akkan	Working at Height & Rescue	01.03.2018- 02.03.2019

Tarık Çetintaş	Working at Height &Rescue	01.03.2018- 02.03.2020
Erkan Çelik	Working at Height &Rescue	01.03.2018- 02.03.2021
Erkan Çelik	Cranes and Lifting Appliances	26-27.02.2019
Tarık Çetintaş	Health and Safety	26-27.02.2019
Murat Sirel	Health and Safety	26-27.02.2019
Osman Nuriş Çoraklı	Health and Safety	26-27.02.2019
Recep Katar	Health and Safety	26-27.02.2019
Erkan Çelik	Health and Safety	26-27.02.2019
İlyas Koçak	Health and Safety	26-27.02.2019
Tarık Şamdanlı	Health and Safety	26-27.02.2019
Taner Akkan	Avanti Safety Anchor Point	16.05.2019
Tarık Şamdanlı	Occupational Accidents	28.02.2019
Osman Nuriş Çoraklı	Occupational Accidents	28.02.2019
Murat Sirel	Occupational Accidents	28.02.2019
Recep Katar	Occupational Accidents	28.02.2019
Tarık Çetintaş	Occupational Accidents	28.02.2019
Erkan Çelik	Occupational Accidents	28.02.2019
İlyas Koçak	Occupational Accidents	28.02.2019
Taner Akkan	Occupational Accidents	28.02.2019
İlyas Koçak	Hydraulic Accumulator	18-22.02.2019
Erkan Çelik	Hydraulic Accumulator	18-22.02.2019
Taner Akkan	Operation of Ladder Guided Service Lift	28.03.2019
Taner Akkan	Operation of Ladder Guided Service Lift	1.04.2019
Erkan Çelik	Inspection of Ladders for Fall Protection	28.02.2019