MONITORING REPORT

Voluntary Carbon Standard 2013

Document Prepared By South Pole Carbon Asset Management Ltd.

Project Title	**Aydin Salavatli Dora-1 Geothermal Power Plant**
Version	**2.0**
Report ID	
Date of Issue	**21/01/2015**
Project ID	**120**
Monitoring Period	**01/09/2011 – 31/12/2014**
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

MENDERES Geothermal Elektrik Uretim A.S, (hereafter referred to as "the Project Owner") is the owner and the license holding company for the grid connected 7.951 MW Aydin Salavatli Dora-I Geothermal Power Plant.

The company has been established in 1999 and is headquartered in Aydın. It was set up as an investment company to provide electricity to both facilities within the MB Holding and other industrial complexes through the generation of electric power from geothermal energy. The company was established as a "generation company" in accordance with the terms and conditions stated in the Electricity Market Licensing Regulation published in the Official Gazette dated 04.08.2002, numbered 248336. The Project Owner continues to invest in the renewable energy sector.

The first drilling activities as part of the project assessment had been started in 2003. Construction was initiated close to the city of Aydın in the village of Salavatlı almost two years later in May 2005 and had been taken one year. The Project commissioned in May 10, 2006 and emission reduction credits were claimed for the period after July 1st, 2008.

The project activity aims to generate electricity from geothermal energy at a heat between 78°C and 170°C. The geothermal fluid is pumped up to the surface through production wells located in the "Aydın, Sultanhisar-Salavatlı geothermal field".

The thermal fluid is passed through a heat exchanger and the heat from the fluid is transferred to a secondary fluid - hydrocarbon. The secondary fluid is vaporized to generate electricity via the turbine and the generator. After having passed the heat exchanger, the geothermal fluid drops to 78°C and is re-injected back to the reservoir via a re-injection well. The production cycle is closed due to complete re-injection of the geothermal brine; thus avoiding any adverse effects to the environment and the performance parameters of the geothermal reservoir. The inhibitor and the dosing pump installed at the well prevent the fluid from causing corrosion and silica sediment deposits.

Further background information on the project activity can be found in the Project Document (VCS PD) and associated documents, which had already been submitted for validation as per requirements of the Voluntary Carbon Standard 2013 and had a positive validation opinion. The VCS PD and associated documents are available upon request.

The total GHG emission reductions generated in this monitoring period is 89,997 tCO2e

1.2 Sectoral Scope and Project Type

According to UNFCCC sectoral scopes definition for CDM projects, the Project Activity is included in the Sectoral Scope 1, category "Energy industries (renewable - / non- renewable sources)".

The project is a single Greenfield investment and is not part of a project group or bundle.

1.3 Project Proponent

Organization name	Menderes Geothermal Elektrik Uretim A.S. (MEGE)
Contact person	Murat Haluk Tufekcioğlu
Title	Manager
Address	No:7/1, Aydın, 09100, Turkey
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South Pole Carbon Asset Management Ltd. acts as carbon asset developer and buyer.

1.4 Other Entities Involved in the Project

N/A

1.5 Project Start Date

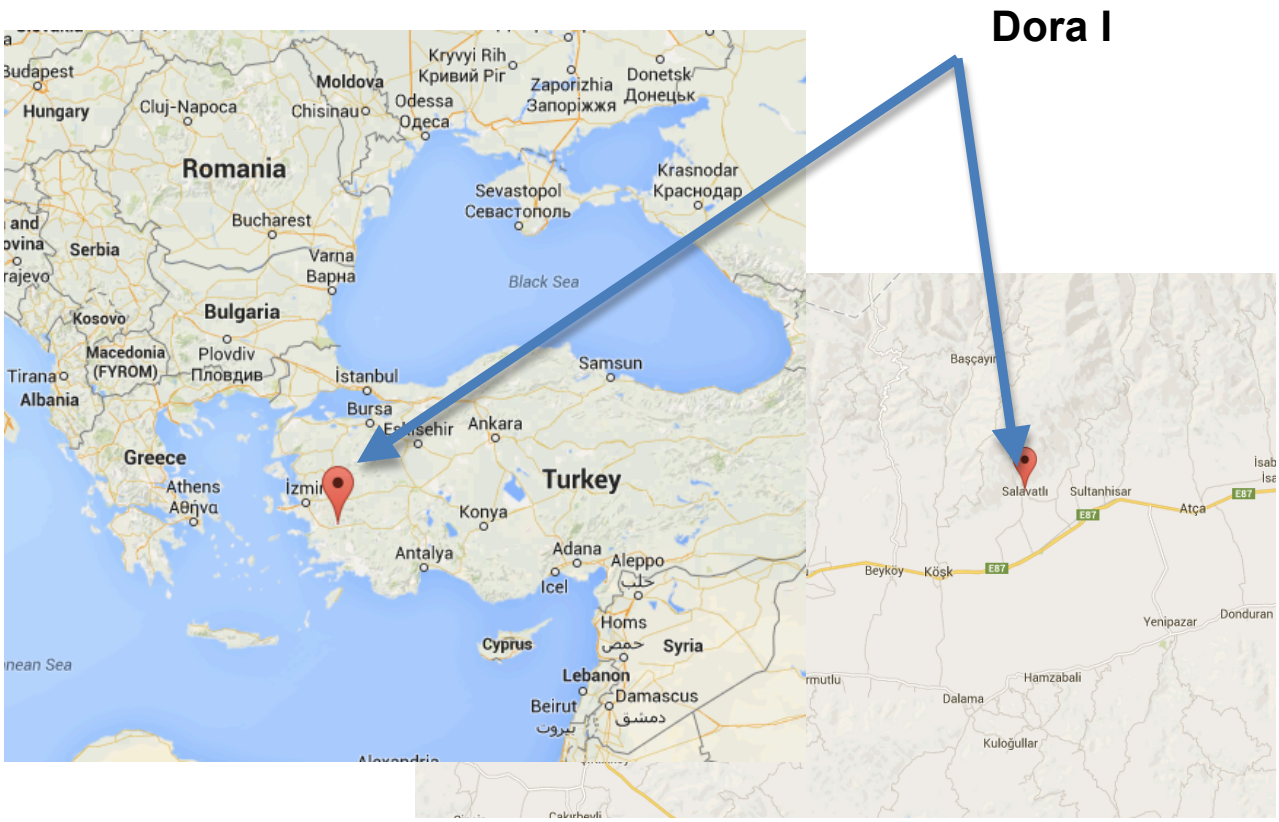
This is the fourth monitoring report of this project activity. The Project commissioned in May 10, 2006 and emission reduction credits were claimed for the period after July 1st, 2008.

1.6 Project Crediting Period

This is the fourth monitoring report of this project activity. The first crediting period is 10 years, from July 1st, 2008 to June 30th, 2018. This monitoring report covers the period from 01/09/2011-31/12/2014 (Both days included).

1.7 Project Location

The Dora-I power plant has been constructed in the West of the village Salavatlı, which is located in the Northeast of the city of Aydın. It was built in a free area in the marginal lands of the village and covers an area of 25'000 square meter including two sides. One of them hosts the production wells named AS-1 and ASR-2. They are connected to the electricity generation facility through 900 meter long isolated tubes in the case of well AS-1 and 100 meter for the ASR-2 well. The re-injection well, named AS-2, is located right at the generation facility.



The geographical location of the Project is 37°53'22 85 N and 28°06'33. 50 E.

1.8 Title and Reference of Methodology

The emission reductions of the Project have been calculated in accordance with the approved small scale CDM-methodology AMS-I.D.: "Grid connected renewable electricity generation", version 13[1]. For baseline calculations the AMS-I.D refers to the "Tool to calculate the emission factor for an electricity system", which offers two options of which the Combined Margin (CM) approach has been chosen. The CM consists of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the above- mentioned tool.

1.9 Other Programs

N/A

[1] AMS-I.D, version 13, valid from December 14th, 2007 onwards, URL: http://cdm.unfccc.int/methodologies/DB/GA1Z9QIWW2MFAX2GT0Y6IYNPGNH0S1/view.html, (28/04/2008).

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

By means of this Monitoring Report greenhouse gas emission reductions achieved by the project activity "Aydin Salavatli Dora-I Geothermal Power Plant" are being verified and certified as per requirements of the Voluntary Carbon Standard, Version 2013. The project has been implemented and is being operated by Menderes Geothermal Elektrik Uretim A.S. (MEGE) and the carbon credits are being realized with support from South Pole Carbon Asset Management Ltd. (SPC). There is no event that may impact the GHG emission reductions and monitoring.

The project is the first private investment employing the specific "Organic Rankine Cycle & Binary Technology in Turkey. The list of equipments is given in table below and the system processing schema is given in Annex.1:

Project Technical Characteristics

No.	Name	Quantity
1	Organic Turbine	2
2	Generator	1
3	12" control valve	3
4	Actuator	7
5	Positioner	9
6	16" control valve	4
7	6" control valve	4
8	4" control valve	2
9	8" control valve	3
10	10" control valve	1
11	Actuator	1
12	Positioner	6
13	12" control valve	4
14	Actuator	1
15	Positioner	1
16	Pentan Pump 1	1
17	Motor	1
18	Pentan Pump 2	1
19	Motor	1
20	O.E.C. Internal Use Transformator	1

2.2 Deviations

2.2.1 Methodology Deviations

N/A

2.2.2 Project Description Deviations

N/A

2.3 Grouped Project

N/A

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2e/MWh
Description	Combined margin CO_2 emission factor for grid connected power generation in year y
Source of data	Caculated
Value applied:	0.591
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2e/MWh
Description	Build margin CO_2 emission factor for grid connected power generation in year y
Source of data	Caculated, further information, please see the VCS PD
Value applied:	0,503
Justification of choice of data or description of measurement methods and procedures applied	$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} * EF_{EL,m,y}}{\sum_m EG_{m,y}}$ EGm,y :Net quantity of electricity generated and delivered to the grid by power unit m in year y

	EFEL,m,y :CO_2 emission factor of power unit m in year y
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2e/MWh
Description	Operating margin CO_2 emission factor for grid connected power generation in year y
Source of data	Caculated, further information, please see the VCS PD
Value applied:	0.679
Justification of choice of data or description of measurement methods and procedures applied	$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} * NCV_{i,y} * EF_{CO2,i,y}}{GEN_y}$$ $FC_{i,y}$: Amount of fossil fuel type i consumed in the project electricity system in year y (ton or $1000m^3$) $NCV_{i,y}$:Net calorific value (energy content) of fossil fuel type i in year y (TJ/kt or TJ/mil m^3) $EF_{CO_2,i,y}$: CO_2 emission factor of fossil fuel type i in year y (tCO_2/TJ) GEN_y: Net electricity generated and delivered to the grid by all power sources serving the system, not including lc-mr power plants, in year y (GWh) i: All fossil fuel types combusted in power sources in the project electricity system in year y
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	w_{OM}
Data unit	%
Description	Weighting of operation margin emissions factor

Source of data	Tool to calculate the emission factor for an electricity system(version 02)
Value applied:	50%
Justification of choice of data or description of measurement methods and procedures applied	Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods; All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.
Purpose of the data	Calculation of baseline emissions
Comments	

Data / Parameter	w_{BM}
Data unit	%
Description	Weighting of build margin emissions factor
Source of data	Tool to calculate the emission factor for an electricity system(version 02)
Value applied:	50%
Justification of choice of data or description of measurement methods and procedures applied	Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods; All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period, unless otherwise specified in the approved methodology which refers to this tool.
Purpose of the data	Calculation of baseline emissions
Comments	

3.2 Data and Parameters Monitored

The net electricity exported to the grid and imported from the grid has been monitored by TEDAS (Turkish Electricity Distribution Company)/ AYDEM by monthly online energy meter readings and has been reflected in the PMUM records on the online portal. As the energy meters are placed in the connection point to the grid, the electricity export data shall already include the deduction of the auxiliary consumption and transmission losses from the electricity generation.

The electricity exported by the project activity as per the official PMUM records from the online portal have been taken as the basis to the emission calculations. In order to be conservative, the electricity imported is subtracted from the electricity exported before emission reduction calculations.

Data / Parameter	EG_y
Data unit	MWh
Description	Net electricity exported to the grid in the year y
Source of data	Measured and verified against electricity sale receipts. The calculation of emission reductions in the monitoring protocols shall be based on the measured electricity.
Description of measurement methods and procedures to be applied	Measured continuously by a power meter and recorded monthly by monitoring employees of TEDAS/ AYDEM by means of online meter readings. Only the net electricity export to the grid shall be taken into account. This means that the monitoring measurement method shall exclude electricity imported from the grid by the project activity and possible transmission losses.
Frequency of monitoring/recording	Measured continuously and recorded monthly
Value monitored:	The annual net electricity supply to the grid has been measured and was 51,284 MWh/2007. This amount is estimated to be the due amount for the coming years.
Monitoring equipment	Power meter
QA/QC procedures to be applied	• Exported electricity to the grid is measured by a kilowatt meter, which is controlled by the electricity distribution company (TEDAS/ AYDEM). • Trained and qualified staff is responsible for recording electricity export data from the kilowatt meter. • A spare meter is used for crosschecking the accuracy and both meters are calibrated if required. • Meters have been maintained/ replaced periodically according to national regulations. As mentioned earlier in section 2, TEDAS/ AYDEM officials have commenced a comparatively more reliable and accurate procedure of online electricity meter readings on a monthly basis and provide a soft copy of the break-up to the project owner and indicate the same in an online portal (PMUM records). These values are

	used for GHG ER calculations..
Purpose of the data	Calculation of baseline emissions
Calculation method	EGy= Net electricity exported- Net electricity imported
Comments	

Data / Parameter	PE_{Dcons}
Data unit	Tons
Description	Diesel consumed from running the diesel generator
Source of data	Plant Records
Description of measurement methods and procedures to be applied	Diesel Consumption has been calculated on the basis of monitored operating hours on the diesel generator engine and its default consumption.
Frequency of monitoring/recording	Monthly
Value monitored:	Value of data would be used to calculate project emissions only if emissions contribute to more than 1%.
Monitoring equipment	
QA/QC procedures to be applied	Data has been collected by qualified plant staff monthly and reported on an annual basis.
Purpose of the data	Calculation of baseline emissions
Calculation method	
Comments	Consumption from the engine is expected to be negligible (below 1% of the total emission reductions)

3.3 Monitoring Plan

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 mainly responsible for the implementation of the monitoring plan. The grid company (TEIAS) uses its own measurements and payment of electricity delivery to the grid takes place against receipt. The measurements are in accordance with the relevant Measurement Regulation of Turkey (Turkish Standards, International Electro- technical Commission Standards), and are not accessible by the project participants or any other party except TEIAS. This prevents any intervention and assures the accuracy and quality of the measurements.

1. Monitoring Objective

The only parameter to be monitored is the amount of electricity supplied to the grid since the baseline emission factor is fixed by ex-ante calculations.

2. Monitoring Organization

The Project Owner supervises and verifies metering and recording, collects data (meter's data reading, sales/ billing receipts), calculates emission reductions and will use a monitoring report

prepared by South Pole. Additionally the switchgear station, where the measurement instruments are read periodically by TEIAS is only accessible to trained TEIAS staff. On the last day of each month, the TEIAS staff performs the reading, upon which the invoicing will be based. The data collected before PDD compilation has been in accordance with the Measurement Regulations of Turkey and receipts have been obtained against delivery. These receipts will be provided for validation and verification.

3. Monitoring Equipment and program

The electric energy metering equipments include two electric energy meters (or kilowatt meter). The grid company (TEIAS) has installed a kilowatt meter and measures the amount of electric power supplied to the power grid.
The electricity recorded by the electric energy meter will suffice for the purpose of billing and emission reduction verification. The monitoring process is as follows:
a) The Project Owner reads and checks the electric energy meter and records the data periodically as the firsthand record of the supplied electricity to the grid;
b) The Project Owner compiles the recorded data of the supplied electricity to the grid monthly and provides the monthly balance sheet of electricity sales to TEIAŞ;
c) TEIAŞconfirms the amount of electricity exported by the Project Owner after the verification, confirmation and acceptance of the electricity data offered by the Project Owner;
d) The Project Owner provides an electricity sales invoice to TEIAS according to actual amount of electricity delivery reflected by the grid company's confirmation. A copy of the invoice is kept by the Project Owner;
e) The Project Owner properly keeps the balance sheet of electricity sales to the grid company.
The periodical records of the electricity meter's data readings are archived electronically and on paper.
The meter reading will be readily accessible for the verification entity. Calibration test records will be maintained for verification.

4. Data Management

The Project Owner properly keeps the electronic spreadsheets and printout of the monthly records of the amount of supplied electricity to the grid as well as the firsthand record of the electricity supplied to the grid. Besides that, the Project Owner collects sales receipts for the power delivered to the grid as a crosscheck. At the end of each crediting year, the Project Owner compiles a monitoring report. Physical documentation of relevance for the monitoring process, such as paper-based maps and diagrams, are collected in a central place, together with the monitoring plan. The Project Owner stores all paper-based information.
All data records will be kept for a period of at least 5 years following the end of the crediting period, or until 2017, whichever comes later.
5. Data quality assurance and data replacement procedures
If during a periodic meter calibration it is found that the meter has a higher error than defined in the meter's manual, the metering data will be adjusted accordingly for the last three months or beginning at the last calibration, whichever happened later.
If the TEIAS meter fails, then data from the Dora-I meter are used. If both meters fail, conservative data substitution procedures are used from the calculation of energy production (for the purpose of VER calculation):

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

The Project aims to generate electricity and CO2 reduction through the substitution of grid electricity generation by fossil fuel fired power. According to the baseline methodology AMS-I.D., the emission reduction ERy by the project activity during a given year y is defined as:

$$ER_y = BE_y - (PE_y + LE_y) \quad (1)$$

where BEy is calculated as

$$BE_y = (EG_y - EG_{baseline}) * EF_{grid,CM,y} \quad (2)$$

where:

The operation margin refers to a cohort of power plants that reflect the existing power plants whose electricity generation would be affected by the proposed project activity. The build margin refers to a cohort of power plants that reflect the type of power units whose construction would be affected by the proposed project activity.

The combined emission factor $EF_{grid,CM,y}$ for the project activity is calculated as a weighted average of Operating Margin emission factor and Build Margin emission factor as described in the "Tool to calculate the emission factor for an electricity system" (EB35);

$$EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y} \quad (3)$$

4.2 Project Emissions

Carbon Dioxide emissions resulting from combustion of fossil fuels are neglected, as these emissions are contributing less than 1% of baseline emissions. The project emissions due to the diesel consumption will be monitored regularly and if these emissions contribute for more than 1% of baseline emissions, then they will be deducted from the baseline emissions to calculate emission reductions of the project activity.

A summary of project emissions in the monitoring period is provided in the table below:

Parameter	Unit	Value	Comments
Initial Operating hours	hrs	368.4	Plant Records
Final Operating hours	hrs	582	Plant Records
Operating hours	hrs	213.6	Calculated
Fuel Consumption Rate	lt/hr	27.61	Technical Data
Fuel Consumption	lt	5897	Technical Data
Density of Diesel	kg/lt	0.83	Supply Papers
Diesel Consumption	kg	4890	Calculated
Diesel Consumption	tonnes	4.8902	Calculated
NCV of Diesel	TJ/Gg	43	2006 IPCC Guidelines for National GHG Inventories
Carbon Emission factor of Diesel	kg/TJ	74100	2006 IPCC Guidelines for National GHG Inventories
Emission Factor for Diesel	tCO2/ ton	3.186	Calculated
GHG Emissions from Diesel	tCO2	16	Calculated

As evident in the calculations presented above, the project emission is 16 tCO2 for the fourth monitoring period, which is much less than 1% of base line emissions The fugitive carbon dioxide

and methane emissions due to continuous well testing and well bleeding are neglected according to best practice and guidance from relevant methodologies.

The Project Emissions have to be considered in the case of the addition of renewable energy generation units at an existing renewable power generation facility, where the existing and new units share the use of common and limited renewable resources. Provided that the Project has been a Greenfield investment it is a standalone project and Project Emissions are:

$$PE_y = 0$$

4.3 Leakage

According to AMS-I.D. Leakage Emission only have to be considered if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity. Since this is not the case in the underlying Project leakage can be considered as:

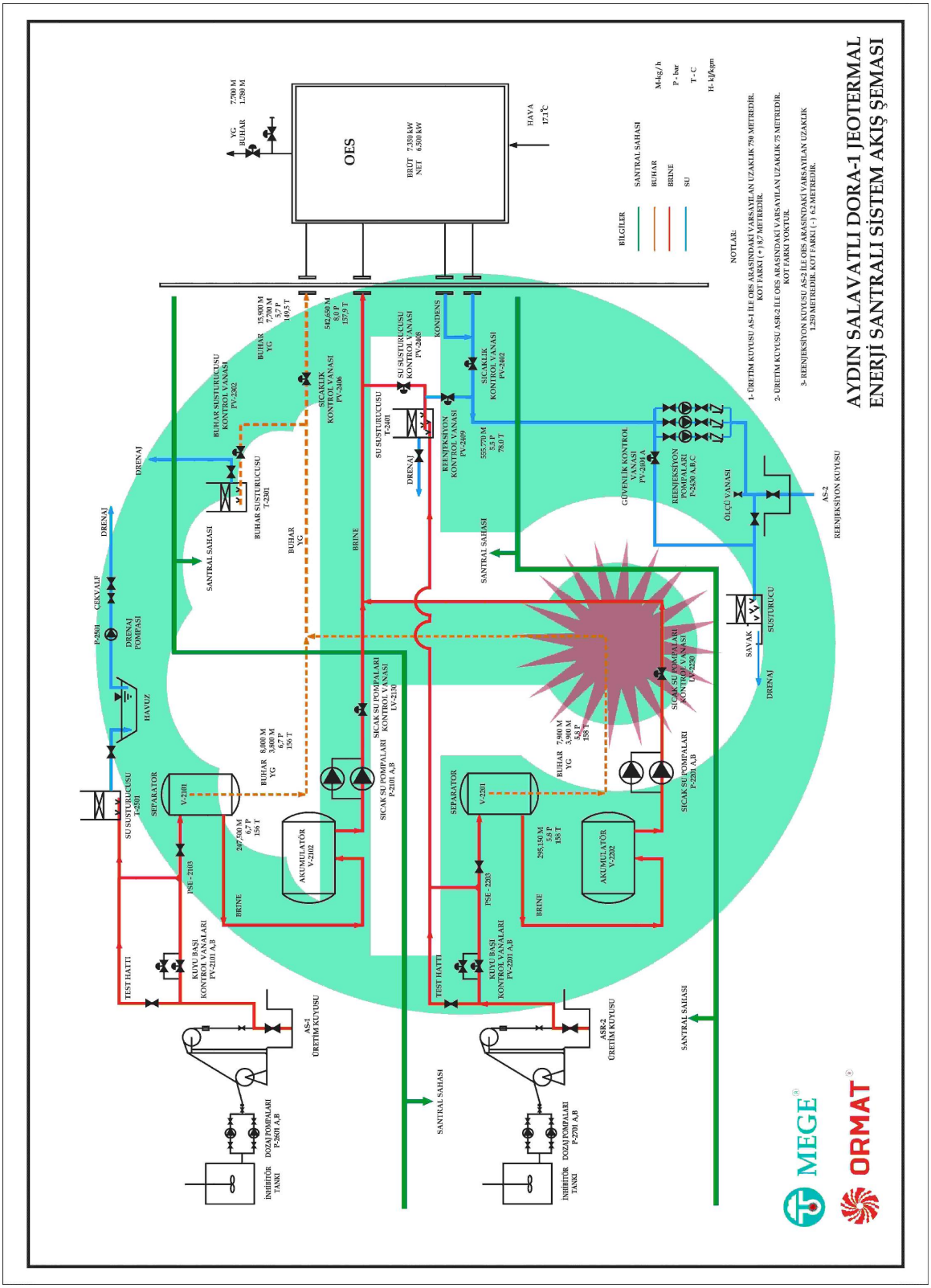
$$LE_y = 0$$

Fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam aren't accounted as Project Emissions, because the non-condensable gases resulting from the produced steam are isolated and delivered to Linde Gaz A.S. that belongs to Linde Group being internationally recognized supplier of industrial gases.

4.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2011(1st September to 31st December)	9,365	0	0	9,365
2012	26,664	0	0	26,664
2013	26,514	0	0	26,514
2014	27,454	0	0	27,454
Total	89,997	0	0	89,997

APPENDIX 1: <PROCESS FLOW CHART>



APPENDIX 2: <Technical Specifications of the Generator>

TAD740GE

Technical Data

General

Engine designation	TAD740GE
No. of cylinders and configuration	in-line 6
Method of operation	4-stroke
Bore, mm (in.)	107 (4.21)
Stroke, mm (in.)	135 (5.31)
Displacement, l (in³)	7.28 (445)
Compression ratio	17.2:1
Dry weight, kg (lb)	901 (1987)
With Gen Pac, kg (lb)	1128 (2487)
Wet weight, kg (lb)	964 (2126)
With Gen Pac, kg (lb)	1196 (2637)

Performance

with fan, kW (hp)	1500 rpm	1800 rpm
Prime Power	220 (299)	228 (310)
Max Standby Power	242 (329)	251 (341)

Lubrication system

Oil consumption, liter/h (US gal/h)	1500 rpm	1800 rpm
Prime Power	0.04 (0.011)	0.05 (0.013)
Max Standby Power	0.05 (0.013)	0.06 (0.016)

Oil system capacity incl filters, liter (US gal)	29 (7.7)
Oil change intervals at specification	
VDS-2, h	600
VDS, ACEA E3, h	400
ACEA E1, E2, API CD, CF, CF-4, CG-4, h	200

Fuel system

Spec. fuel consumption at Prime Power, g/kWh (lb/hph)	1500 rpm	1800 rpm
25 %	227 (0.368)	230 (0.373)
50 %	200 (0.324)	205 (0.330)
75 %	198 (0.321)	199 (0.323)
100 %	200 (0.324)	200 (0.324)
Max Standby Power, g/kWh (lb/hph)		
25 %	219 (0.355)	230 (0.373)
50 %	200 (0.324)	203 (0.329)
75 %	198 (0.321)	199 (0.323)
100 %	201 (0.326)	202 (0.328)

Intake and exhaust system

Air consumption at 27°C, m³/min (cfm)	1500 rpm	1800 rpm
Prime Power	14.7 (519)	17.6 (622)
Max Standby Power	15.6 (551)	18.6 (657)

Max allowable air intake restriction, kPa (In wc)	5 (20.1)

Heat rejection to exhaust, kW (BTU/min)	1500 rpm	1800 rpm
Prime Power	160 (9099)	164 (9327)
Max Standby Power	180 (10237)	184 (10464)
Exhaust gas temperature after turbine, °C (°F)	1500 rpm	1800 rpm
Prime Power	525 (977)	470 (878)
Max Standby Power	540 (1004)	485 (905)

Max allowable back-pressure in exhaust line, kPa (In wc)	10 (40.2)

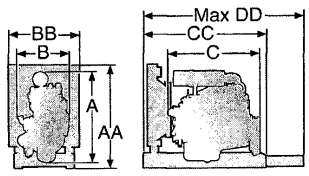
Exhaust gas flow, m³/min (cfm)	1500 rpm	1800 rpm
Prime power	39.2 (1384)	43.0 (1519)
Max Standby Power	41.8 (1476)	46.3 (1635)

Cooling system

Heat rejection radiation from engine, kW (BTU/min)	1500 rpm	1800 rpm
Prime Power	13 (737)	13 (737)
Max Standby Power	15 (850)	15 (850)
Heat rejection to coolant, kW (BTU/min)		
Prime Power	99 (5630)	99 (5630)
Max Standby Power	106 (6028)	110 (6256)
Fan power consumption, kW (hp)	5 (7)	8 (11)

Standard equipment	Engine	Gen Pac
Engine		
Automatic belt tensioner	•	•
Lift eyelets	•	•
Flywheel		
Flywheel housing with conn. acc. to SAE 2	•	•
Flywheel for 11.5" flex. plate and flexible coupling	•	•
Vibration damper	•	•
Engine suspension		
Fixed front suspension	-	•
Lubrication system		
Oil dipstick	•	•
Full-flow oil filter of spin-on type	•	•
By-pass oil filter of spin-on type	•	•
Oil cooler, side mounted	•	•
Fuel system		
Twin fuel filters of disposable type	•	•
Flexible fuel lines	-	•
Fuel injection pump, Bosch, with electronic actuator	•	•
Intake and exhaust system		
Air filter with replaceable paper insert	•	•
Air restriction indicator	•	•
Air cooled exhaust manifold	•	•
Connecting flange for exhaust line	•	•
Turbo charger	•	•
Heat guard for exhaust pipe and turbo	•	•
Crankcase ventilation	•	•
Cooling system		
Tropical radiator including intercooler	•[1]	•
Radiator guard	-	•
Gear driven coolant pump	•	•
Fan hub	•	•
Thrust fan	-	•
Fan guard	-	•
Belt guard	-	•
Alternator		
Alternator 60A / 24V low, right side	•	•
Starting system		
Starter motor, Bosch 5.4kW / 24V	•	•
Electrical wiring		
Cable iron	•	•
Instruments and senders		
Temp.- and oil pressure for automatic stop/alarm 103°C	-	•
Other equipment		
Expandable base frame	-	•
Engine Packing		
Plastic wrapping	•	•

[1] must be ordered, se order specification - optional equipment
– optional equipment or not applicable
• included in standard specification



A* = 1375 mm / 54.0 in
B* = 945 mm / 37.2 in
C* = 1697 mm / 66.8 in
*Incl. radiator & intercooler

AA = 1490.5 mm / 58.7 in
BB = 945 mm / 37.2 in
CC = 1732 mm / 68.2 in
DD = 2722 mm / 107.2 in

Note! The engine illustrated may not be entirely identical to production standard engines.

Power Standards
The engine performance corresponds to ISO 3046, BS 5514 and DIN 6271. The technical data applies to an engine without cooling fan and operating on a fuel with calorific value of 42.7 MJ /kg (18360 BTU/lb) and a density of 0.84 kg/liter (7.01 lb/US gal), also where this involves a deviation from the standards. Power output guaranteed within 0 to +2% att rated ambient conditions at delivery. Ratings are based on ISO 8528.
Engine speed governing in accordance with ISO 3046/IV, class A1 and ISO 8528-5 class G3

Exhaust emissions
The engine complies with EPA / CARB - Tier 1 and TA-luft exhaust emission regulations.

Rating Guidelines
PRIME POWER rating corresponds to ISO Standard Power for continuous operation. It is applicable for supplying electrical power at variable load for an unlimited number of hours instead of commercially purchased power. A10 % overload capability for governing purpose is available for this rating.
MAXIMUM STANDBY POWER rating corresponds to ISO Standard Fuel Stop Power. It is applicable for supplying standby electrical power at variable load in areas with well established electrical networks in the event of normal utility power failure. No overload capability is available for this rating.
1 hp = 1 kW x 1.36

Information
For more technical data and information, please look in the Generating Set Engines Sales Guide.

VOLVO PENTA

AB Volvo Penta
SE-405 08 Göteborg, Sweden
www.volvopenta.com

APPENDIX 3: <SUMMARY OF MONITORING DATA AND RESULTS>

A summary of monitoring data and emission reductions based on aggregated data on a monthly basis are provided in the table below:

			Official Records (PMUM)		Calculations		
Sl. No.	Year	Month	Net Electricity exported (kWh)	Net electricity imported (kWh)	Balance of Net electricity Exported to the Grid (kWh)	GHG Emission Factor (tCO2/MWh)	Emission Reductions (tCO2e)
1	2011	September	3,239,838	277	3,239,561	0.591	1,915
2		October	3,877,550	4,738	3,872,812	0.591	2,289
3		November	3,985,796	4,990	3,980,806	0.591	2,353
4		December	4,754,421	907	4,753,514	0.591	2,809
Sub-Total-2011			**15,857,605**	**10,912**	**15,846,693**		**9,365**
5	2012	January	4,772,981	3,944	4,769,037	0.591	2,819
6		February	4,318,524	3,238	4,315,286	0.591	2,550
7		March	4,539,969	945	4,539,024	0.591	2,683
8		April	3,836,751	4,385	3,832,366	0.591	2,265
9		May	3,329,827	10,294	3,319,533	0.591	1,962
10		June	3,023,672	5,758	3,017,914	0.591	1,784
11		July	2,995,348	3,289	2,992,059	0.591	1,768
12		August	3,105,434	1,638	3,103,796	0.591	1,834
13		September	3,231,799	2,054	3,229,745	0.591	1,909
14		October	3,681,456	1,273	3,680,183	0.591	2,175
15		November	3,935,371	2,898	3,932,473	0.591	2,324
16		December	4,388,820	3,125	4,385,695	0.591	2,592
Sub-Total-2012			**45,159,952**	**42,841**	**45,117,111**		**26,664**
17	2013	January	4,365,018	2,369	4,362,649	0.591	2,578
18		February	3,841,475	1,726	3,839,749	0.591	2,269
19		March	4,033,689	2,684	4,031,005	0.591	2,382
20		April	1,669,803	20,135	1,649,668	0.591	975
21		May	4,061,535	1,336	4,060,199	0.591	2,400
22		June	3,662,972	3,541	3,659,431	0.591	2,163
23		July	2,429,784	13,406	2,416,378	0.591	1,428
24		August	3,558,064	353	3,557,711	0.591	2,103
25		September	3,769,681	731	3,768,950	0.591	2,227
26		October	4,259,481	769	4,258,712	0.591	2,517
27		November	4,353,917	1,978	4,351,939	0.591	2,572
28		December	4,907,184	101	4,907,083	0.591	2,900
Sub-Total-2013			**44,912,603**	**49,129**	**44,863,474**		**26,514**
29	2014	January	4,725,277	983	4,724,294	0.591	2,792
30		February	4,126,815	239	4,126,576	0.591	2,439
31		March	4,307,272	353	4,306,919	0.591	2,545
32		April	3,819,237	769	3,818,468	0.591	2,257
33		May	3,561,201	1,348	3,559,853	0.591	2,104
34		June	3,217,423	2,243	3,215,180	0.591	1,900
35		July	3,152,129	2,016	3,150,113	0.591	1,862
36		August	3,182,760	1,600	3,181,160	0.591	1,880
37		September	3,570,588	1,210	3,569,378	0.591	2,110
38		October	4,133,783	1,197	4,132,586	0.591	2,442
39		November	4,292,064	605	4,291,459	0.591	2,536
40		December	4,379,302	1,142	4,378,160	0.591	2,587
Sub-Total-2014			**46,467,851**	**13,705**	**46,454,146**		**27,454**
Total			**152,398,011**	**116,587**	**152,281,424**		**89,997**
Total Baseline Emisssons (tCO2e)							**89,997**
GHG Emissions from DG Set (tCO2e)							**-**
Total GHG ERs (tCO2e)							**89,997**

Parameter	Unit	Value	Comments
Initial Operating hours	hrs	368.4	Plant Records
Final Operating hours	hrs	582	Plant Records
Operating hours	hrs	213.6	Calculated
Fuel Consumption Rate	lt/hr	27.61	Technical Data
Fuel Consumption	lt	5897	Technical Data
Density of Diesel	kg/lt	0.83	Supply Papers
Diesel Consumption	kg	4890	Calculated
Diesel Consumption	tonnes	4.8902	Calculated
NCV of Diesel	TJ/Gg	43	2006 IPCC Guidelines for National GHG Inventories
Carbon Emission factor of Diesel	kg/TJ	74100	2006 IPCC Guidelines for National GHG Inventories
Emission Factor for Diesel	tCO2/ ton	3.186	Calculated
GHG Emissions from Diesel	tCO2	16	Calculated