CLEAN DEVELOPMENT MECHANISM
CDM MONITORING REPORT

Talia Landfill Gas Recovery Project and Electricity Production

Registration Number UNFCCC 000000839

Monitoring period from 11/03/2007 to 31/12/2007.

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SECTION A. General project activity information

A.1 Title of the project activity:

Title: Talia Landfill Gas Recovery Project and Electricity Production

A.2. CDM registration number:

Registration Number UNFCCC 000000839

A.3. Short description of the project activity:

The purpose of the project is to extract landfill gas from an existing landfill and uses its methane content for energy production. The project is located in the Jordan Valley near the agriculture community Menahamia. The Talia landfill site was established in 1977 by the 5 municipal authorities.

The site was closed by 31.12.1999. There are two complementary activities reducing greenhouse gases in the project: a) Collection and controlled combustion of landfill gas, converting CH4 emissions into CO2 and therefore reducing its greenhouse effect, and b) using landfill gas as an alternative fuel. The power is delivered to the national grid where it replaces power generated from fossil fuels. The project baseline is the continued practice of uncontrolled and unlimited release of landfill gas (CH4) to the atmosphere. The usage of fossil fuel (according to the carbon intensity of the national grid) for power generation. Project participants are Madei Taas Ltd from Israel and Kommunalkredit from Austria. The project starting date is 1 October 2006 and the start of the 7 year renewable crediting period is the point of time at registration. The expected operational lifetime is 21 years.
The project has been registered as a CDM activity on 11 March 2007 and has the reference number 0839.

A.4. Monitoring period:

The monitoring period is from 11/03/2007 to 31/12/2007.

A.5. Methodology applied to the project activity (incl. version number):

A.5.1. Baseline methodology:

ACM0001 ver4 “Consolidated baseline methodology for landfill gas project activities”
Small scale methodology AMS-I.D. “Grid connected renewable electricity generation”

A.5.2. Monitoring methodology:

ACM0001 ver4 “Consolidated baseline methodology for landfill gas project activities”
Small scale methodology AMS-I.D. “Grid connected renewable electricity generation”

A.6. Status of implementation including time table for major project parts:

No deviation to the registered PDD is requested.

A.7. Intended deviations or revisions to the registered PDD:

No deviation to the registered PDD is requested.

A.8. Intended deviations or revisions to the registered monitoring plan (Decision 17/CP.7, Annex H, paragraph 57 to be considered):

No deviations or revisions to the registered monitoring plan

A.9. Changes since last verification:

During the rest of the verification period no major change were made.

Resolution and solutions of FARs from the initial Verifications 27 Juli 2007

The following table presents the issues raised during the last Verification Report No. 982547, Version 0 and their resolutions:

TYPE OF ISSUE RISED	Validation team conclusion	Changes since last verification
Forward Action Request No.1 For the periodic	Methane analysis in exhaust gas and accuracy of	During the Monitoring Period, one analyze of methane concentration was made: in March/2007 and the next analyze was done in January/2008.

measurements of the methane in the exhaust gas a portable device is used. The maximum accuracy of +/- 0,5 % of the device needs to be considered (in Emission Reduction Calculations). The device should also be considered for (field) calibration. Consider to use a measurement system that indicates ppm of methane in exhaust gas (e.g available in disposable form).	currently used device is considered inappropriate and another device/ approach needs to be used.	According to FAR1, the specialized analyzing company A.S Research, is in charge to provide annually analyzing of methane concentration in the exhaust stack of the flare.
Forward Action Request No.2 The structure / format / final layout of the main daily monitoring sheets and the monthly aggregation	Hardcopy record keeping is considered Adequate. Streamlining of recording with PLC remains in	Solution of calculations of i) operating hours of the flare and ii) operating hours of the engine, provided automatically on the monthly streamline data file, according to Flare gas temperature and Export electricity totalizing, represented in the Monitoring Manual – Annex 3

remains to be defined and submitted in its final version (in line with scheduled reading procedures) The template to be used needs to be in full consistence with requirements of the Monitoring Plan for each parameter (e.g. continuous reading, electronic and pa per): 1-3 (LFG), 5 (flame temp.), 6 (WCH4), 7 (T), 8 (P), 9 (Elex),10 (Elimp) (and for Hagal:) 16 (LFG), 17 (Pres), 18 (Temp), 19 (CH4 in LFG). Note that for 9 (Elex),10 (Elimp) metering / reading is considered necessary for crosschecking the data as	process and will be reviewed at regular verification.	

provided by the utility. Furthermore the template and reporting needs to consider: i) operating hours of the flare and ii) operating hours of the engine. The final layout that will be used (and that is in line with data provided by the PLC) shall be submitted to the auditor. If the draft version of the template for manual readings (Plant Operations Journal) is used in any form (e.g. for crosschecks / as part of a procedure if the PLC fails / to complement data that is not available via PLC) include clear labeling of the meters. An updated version of the		

template shall be made available		
Forward Action Request No.3 The consistency of data series for emission reduction calculation before and after the modifications on metering (methane analyzer / blower) need to assured at first periodic verification. (FAR4	Consistency to be reviewed at regular periodic verification.	Consistency of data was approved by modification of connection of methane analyzer sampling. The modification was done on 12.07.07 (see description of protocol P5 in section B.4.)
Forward Action Request No.4 It remains unclear how the amount methane from Talia destroyed via flaring is calculated exactly. (compare statement included in D.2.4 and NIR 4 of validation report). An example on the	Due to the special design of the project with two related landfill sites, the actual calculation of Emission reduction is considered to be of special relevance and will be further analyzed at regular	Calculation of the actual Emissions provided automatically in the Monthly report template file, by the follow , build in formulas (for detailed explanation see Monitoring Manual – Annex 3)

concrete calculations of the project's Emission Reductions shall be submitted to the auditor (e.g. for the first month based on an Excel Spreadsheet).	periodic verification.	

A.10. Person(s) responsible for the preparation and submission of the monitoring report:

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SECTION B. Key monitoring activities according to the monitoring plan for the monitoring period stated in A.4. (referring to Decision 17/CP.7, Annex H, paragraph 53 (a) – (d) on data collection and archiving)

B.1. Monitoring equipment:

B.1.2. Table providing information on the equipment used (incl. manufacturer, type, serial number, date of installation, date of last calibration, information to specific uncertainty, need for changes and replacements):

Pos. ID	Tag. No	Data source device	Model	Manufacturer	Serial number	Range	Date of installation	Date of last calibration	Max Error (+/- %)	Date of next calibration	Calibration period
1.LFG total.y	F2T	Flow Meter Talia	Proline Prowirl 72-F1H-S-K-O-A-A-1-3-A-A-4-A-A	Endress+Hauser	910A8E02000	0-1500 m3/h 1 pulse=1 m3/h	15.02.07	07.02.08	1.0	07.02.09	Yearly
16	F2H	Flow Meter Hagal	Proline Prowirl 72-F1H-S-K-O-A-A-1-3-A-A-4-A-A	Endress+Hauser	910A8F02000	0-1500 m3/h 1 pulse=1 m3/h	15.02.07	07.02.08	1.0	07.02.09	Yearly

2.LFG flare	F4F	Flow Meter Flare	Proline Prowirl 72-F80-S-K-O-A-A-1-3-A-A-4-A-A	Endress+Hauser	8B06E802000	0-1000 m3/h 1 pulse=1 m3/h	20.12.06	07.02.08	1.0	07.02.09	Yearly
3.LFG electricity.y	F4G	Flow Meter Generator	Proline Prowirl 72-F1F-S-K-O-A-A-1-3-A-A-4-A-A	Endress+Hauser	850BA502000	0-1500 m3/h 1 pulse=1 m3/h	15.06.06	07.02.08	1.0	07.02.09	Yearly
5.FE	TT02	Flare Temperature Element	103-HT TC-TYPE S	Mihshur	N/A-std	0-1500 deg C	13.11.06	Doesn't required	1.0	Doesn't required	Indicative device (thermocouple), recalibration doesn't required
6.WCH4.Y	B2T	.Methane LFG analyzer Talia.	Visit-04	EHEIM Messtechnik	516	O2 (0-21%) CH4 (0-100%)	15.10.06	08.01.08	2.0	08.03.08	Every 3 months

19	B2H	.Methane LFG analyzer Hagal.	Visit-04	EHEIM Messtechnik	515	O2 (0-21%) CH4 (0-100%)	15.10.06	08.01.08	2.0	08.03.08	Every 3 months
7.T	T2T	LFG gas temperature transmitter Talia	Jumo 956550/888/888/888+PT100	Jumo/ Mihshur	N/A-std	0-100 deg C	13.11.06	27.01.08	0.2	31.01.09	Yearly
18	T2H	LFG gas temperature transmitter Hagal	Jumo 956550/888/888/888+PT100	Jumo/ Mihshur	N/A-std	0-100 deg C	13.11.06	27.01.08	0.2	31.01.09	Yearly
18.P	P2T	LFG gas pressure transmitter Talia	Fuji FCX2-CFKKT33V4-LXCYYAA	Fuji Electric	A6F9239F	0-200 mBar	13.11.06	27.01.08	0.25	31.01.08	Yearly
17	P2H	LFG gas pressure transmitter Hagal	Fuji FCX2-CFKKT33V4-LXCYYAA	Fuji Electric	A6F9238F	0-200 mBar	13.11.06	27.01.08	0.25	31.01.08	Yearly
10.EL exp.lfg	HV/I/E	Electric power sold to the grid	C192PF8 Powermeter	Satec	622633	N/A	13.11.06	Factory	0.4	Doesn't required	Life calibration

9. EL imp	HV/I /E	Electricity intake from the grid	C192PF8 Powermeter	Satec	622633	N/A	13.11.06	Factory	0.4	Doesn't required	Life calibration
5. FE	N/A	Periodic measurement of methane content of flare exhaust gas	Specialised company	N/A	N/A	N/A	N/A	27.01.08	N/A	27.01.09	Yearly

B.1.3. Calibration procedures:

Calibration procedures according to table in section B.1.2 .

B.1.4. Involvement of Third Parties:

-"A.S. Research" is involved as certified laboratory for yearly analysis of methane concentration in the exhaust gas

B.2. Data collection (accumulated data for the whole monitoring period):

B.2.1. List of fixed default values:

Global Warming Potential of CH4 (GWPCH4) = 21 tCO2e/tCH4;
Specific gravity of Methane, (Dch4) = 0,0007168 tons/m3, at the standard state (1013 mBar, 0℃ = 273.15K)

B.2.2. List of variables:

P bar, mBar =site barometric pressure
LFG volume talia, m3= amount of LFG collected from the talia landfill
LFG volume hagal, m3= amount of LFG collected from the hagal landfill
LFG volume flared, m3= amount of LFG destroyed in flare
LFG volume electricity, m3= amount of LFG destroyed in gas generator
%CH4 talia = percentage of methane in the biogas, collected from talia landfill (% volume)
%CH4 hagal = percentage of methane in the biogas, collected from haga landfill (% volume)
P gas talia , mBar = pressure of LFG collected from the talia landfill

P gas hagal , mBar = pressure of LFG collected from the hagal landfill
T gas talia, deg C = temperature of LFG collected from the talia landfill
T gas hagal, deg C = temperature of LFG collected from the hagal landfill
EG exp = amount of electricity exported to the grid (kWh);
EG inp = amount of electricity imported from the grid (kWh);
EF grid. Emission Factor of the S-SE-CO Israelian Grid (EF) = 0.000785 tCO2e/kWh, as calculated in Annex 6
FE=90.% Flare efficiency, default and most conservative value, according to CDM-PDD Version 2
AF Adjustment Factor for regulatory obligations to reduce methane emissions: AF= zero
(**We confirm that we annually monitored and traced the environmental regulations, and there is NOT any new issued regulation that requires Talia landfill to destroyed the collected CH4)**

B.2.3. Data concerning GHG emissions by sources of the project activity (referring to paragraph 53(a)):

According to ACM0001 – version 04, and since the used technology does not involve equipment transferred from another activity and the existing equipment is not transferred to another activity, no leakage needs to be considered.

B.2.4. Data concerning GHG emissions by sources of the baseline (referring to paragraph 53(b)):

Table, providing summery of GHG emission reduction calculation, advised in section D1.

B.2.5. Data concerning leakage (referring to paragraph 53(c)):

According with ACM0001 – version 04, no leakage needs to be considered.

B.2.6. Data concerning environmental impacts (referring to paragraph 53(d)):

No environmental impacts have been detected during monitoring period.
No negative impacts of birds have been detected during monitoring period, as stated bellow:

Hagal Landfill

Statment

We confirm that during 2007, each daily inspection and filling of daily monitoring journal of flaring and generator system, included visual monitoring of possible impact of flare and generator to life of birds.

Death of birds in flaring and generator area wasn't monitored during 2007.

Roee Federman
Roee
Site Manager
Hagal Landfill

Regular payments to the employees have been done during monitoring period, according to the regulations in Israel.
Medical care of local staff were carried out during monitoring period, according to the regulations in Israel.

B.3. Data processing and archiving (incl. software used):

The 3 levels of data processing, recording and archiving in use.
Detailed information according to Monitoring Manual- Annex 3.

B.4. Special event log:

The all special events which occurred during monitoring period fixed in Protocols P1 to P8:

Date	Protocol number	Special event
4.4.07	P1	Repair of PLC data logger and restoring of the log files.
4.4.07	P2	Re-Setting of gas pressure measurement units , cancelling of the CO sensors in analyzers 0515, Hagal, and 0516, Talia, were cancelled on reason to establish monitoring of CH4.
12.07.07	P3	The grid black out was registered on site on 26.06.07 , between 14:00 to 17:00 After return of the grid, the Kyoto system was properly automatically started up.
12.07.07	P4	Inspection of unstable reading EHEIM Visit 4 analizer Tag B2H, s/n 515 of Hagal.

12.07.07	P5	According to approving letter of Mr. Martin Schroeder, TÜV SÜD Industrie Service GmbH ,Carbon Management Service , the intake sample pipes of gas analyzers were modified on 12.07.07
9.08.07	P6	Establishing of electronically record of the analyzer Hagal , tag. B2H.
09.10.07	P7	Establishing of periodically interruption of reading of gas pressure values. In the Monthly report the failure values on 20.09.07 and 21.09.07, were replaced with the last value of gas pressure, proved by gas flow, for mass calculations.
21.10.07	P8	Establishing of periodically interruption of reading of gas pressure values. In the Monthly report the failure values on 18.10.07, 19.10.07 and 20.10.07, were replaced with the last value of gas pressure, proved by gas flow, for mass calculations.
03.02.08	P9	The additional monitored manually and calculated electrically production for period 11.03.07 to 25.03.07 , and 22.07.07 to 01.08.07, is 484691 kW.

SECTION C. Quality assurance and quality control measures

C.1. Documented procedures and management plan:

Quality control management organized according to Annex 10 Quality control Manual.

C.1.1. Roles and responsibilities:

The following table presents roles and responsibilities of the employees were hired during the Monitoring Period :

Employee	Function
David Alter	Talia plant supervisor
Roi Federman	Hagal plant supervisor
Alex Voskoboinik	Madei Taas monitoring supervisor

C.1.2. Trainings:

All training was supplied before the project's implementation and as verified during the 1st verification. The following table presents the
employees were hired during the Monitoring Period – all of them received the proper training, as checked by the Verification Team

Employee	Function
David Alter	Talia plant supervisor

Roi Federman	**Hagal plant supervisor**
Alex Voskoboinik	**Madei Taas monitoring supervisor**

Additional training to Mr. Voskoboinik Alexander was provided by company Messtechnik EHEIM Gmbh, manufacturer of LFG analyzers, on September 2006.

C.2. Involvement of Third Parties:

-"Madei Taas" involved for periodically calibration of methane analyzers, as company, certificated by manufacturer, EHEIM.
-" Instrumetrics Industrial Control" involved for periodically verification of flow meters, as company, certificated by manufacturer, Endress+Hauser

C.3. Internal audits and control measures:

Internal audits and control provided by Madei Taas monitoring supervisor

C.4. Troubleshooting procedures:

Troubleshooting procedures provided according to Monitoring Manual – Annex 4

SECTION D. Calculation of GHG emission reductions (referring to Decision 17/CP.7, Annex H, paragraph 53 (f) and 59)

D.1. Table providing the formulas used:

A	Site barometric pressure	mBar
B	Talia LFG collected	m3
C	Talia Methane content	%
D	Talia gas pressure	mBar
E	Talia gas temperature	deg C
F=B x C/100 x 0.0007168 x (A+D)/1013 x 273.15 / (E+273.15)	Talia Methane mass collected	ton CH4
G	Flow meter error	%
H	Methane meter error	%
I	Pressure meter error	%
J	Temperature meter error	%
K = sqr (G^2 + H^2 + I^2 +J^2)	Total error from measuring equipment	%
L = F x (1 – K/100)	Talia Methane mass collected corrected	ton CH4
M	Hagal LFG collected	m3
N	Hagal Methane content	%
O	Hagal gas pressure	mBar
P	Hagal gas temperature	deg C
Q=M x N/100 x 0.0007168 x (A+O)/1013 x 273.15 /(P+273.15)	Hagal Methane mass collected	ton CH4
R	Flow meter error	%
S	Methane meter error	%
T	Pressure meter error	%

U	Temperature meter error	%
V = sqrt (R^2 + S^2 + T^2 + U^2)	Total error from measuring equipment	%
W=Q x (1-V)	Hagal Methane mass collected corrected	ton CH4
X	LFG sent to the flare	m3
Y	LFG sent to electricity facility	m3
Z=(L+W) x Y / (X+Y)	Methane destroyed in the engine for power production:	ton CH4
AA=(L+W)-Z	Methane sent to flare	ton CH4
AB	Flare efficiency	%
AC=AA x AB/100	Methane destroyed in the flare	ton CH4
AD=Z+AC-W	Methane destroyed in the period	ton CH4
AE	Electricity exported to grig	kWh
AF	Electricity imported from grig	kWh
AG=AE-AF	Electricity production in period	kWh
AH	Electricity meter error	%
AI	Electricity production corrected	kWh
AJ=0.000785	Emission Factor of the S-SE-CO Israelian Grid	tCO2e/kWh
AK=AI x AJ	Greenhouse gas emission reduction from electricity production	tCO2
AL=21	Global warming potential of CH_4	tCO2e/tCH4

AM=AD x AL	Emission reduction by methane, destroyed in period	tCO2
AN=AK+AM	Total emission reduction in period	tCO2

For period from 11.03.07 to 12.07.07, before modification of the intake sample pipes of gas analyzers, done on 12.07.07(see protocol P5, from 12.07.07, above), values of CH4 content in LFG of Talia and Hagal landfills, were corrected by the most conservative approach , that was capping any exante value by the lower edge of the 95 % confidence level of the expost values

The follow formulas used for calculations, as per CDM_PDD version 2:

Emission reduction per year:

$ER_y = (MD_{project,y} - MD_{reg,y}) * GWP_{CH4} + EG_y * CEF_{electricit,y}$

(ER_y = (805.199 – 0) x 21 + 4224.227 = 21133.409 tCO2)

Methane destroyed per year due to regulatory requirements

$MD_{reg,y} = MD_{project,y}$ * AF (in this case zero as there are no requirements)

Adjustment Factor for regulatory obligations to reduce methane emissions:

AF= zero

Explanation: **There are no regulatory requirements monitored in 2005-2007 in Israel**

($MD_{reg,y}$ = 805.199 x 0 = 0 tCH4)

Methane destroyed per year:

$MD_{project,y} = MD_{flared,y} + MD_{electricity,y}$ - Methane delivered from the Hagal field

($MD_{project,y}$ = 251.629 + 1217.624 - 664.054=805.199 tCH4 tCH4)

Methane destroyed in the flare:

$MD_{flared,y} = LFG_{flared,y} * w_{CH4,y} * D_{CH4} * FE$

Explanation: The exact amount of methane destroyed is calculated from the main volume meter

($MD_{flared,y}$ =279.588 x 0.90 = 251.629 tCH4)

Methane destroyed in the engine for power production:

$MD_{electricity,y} = LFG_{electricity,y} * w_{CH4,y} * D_{CH4}$

Explanation: The exact amount of methane destroyed is calculated from the main volume meter

($MD_{electricity,y}$ = 1217.624 tCH4)

Electricity generation

EG_y = Electricity generated per year – electricity consumed per year

(EGy = 4909957 – 13467 = 4896490 kWh)

(EG manually monitored = 484691 kWh)

(Total EGy = 4896490 + 484691 = 5381181 kWh)

Greenhouse gas emission reduction from electricity production:
$CO_{2\ avoided,\ y}$ = EGy * $CEF_{electricity}$ (as provided by official sources)

($CO_{2\ avoided,\ y}$ = 5381181 x 0.000785 = 4224.227 tCO2)

Methane density:
D_{CH4} = 0.0007168 * (P/101.3) * (273.15/T)

Explanation: The specific gravity of methane gas (D_{CH4}) is the specific gravity (0.0007168t/Nm^3) (according to the consolidated monitoring method) of methane gas in the standard state (101.3kPa, 0℃ = 273.15K) with correction for actual temperature (T = ID2) and pressure (P = ID3).

Global warming potential of CH_4:

GWP CH_4 = 21t CO_2e/tCH_4

The follow calculation provided automatically for every hour record, by Monthly Report Template file.

Table, providing summery of GHG emission reduction calculation:

Source		Hagal Landfill	Talia Landfill	Generator			Flare
ID		MD hagal	MD talia	10.EL imp	9.EL ex.lfg	MD electricity	MD flared
TAG				HV/I/E	HV/I/E		
Month	Period	Mass CH4 Landfill [tonn]	Mass CH4 Landfill [tonn]	P_in[Kwh]	P_out[KWh]	Mass CH4 Generator [tonn]	Mass CH4 Flare [tonn]
March	(11.03.07-31.03.07)	33.387	70.053	1552	92420	92.041	11.399
April	full month	27.957	95.711	1467	459815	103.175	20.494
May	full month	47.149	92.669	1201	517711	116.919	22.899
June	full month	68.677	86.331	996	600249	140.015	14.992
July	full month	68.541	81.599	2472	263300	103.472	46.668
August	full month	87.138	73.744	1371	617434	148.824	12.059
September	full month	77.012	71.373	1380	579150	132.665	15.720
October	full month	82.965	95.717	2172	442499	101.292	77.390
November	full month	91.701	92.085	553	644928	147.718	36.068
December	full month	94.881	93.140	357	712170	159.659	28.362
total		679.409	852.423	13521	4929676	1245.779	286.053
total error		2.260	2.260	0.400	0.400	2.260	2.260
total corrected		664.054	833.158	13467	4909957	1217.624	279.588

Parameter	ID	Formula used	Units	Value
Flare efficiency	FE		%	90.0
CH4 destructed in Flare	MD flared,y	MD flared.y=MD flared x FE/100	tCH4	251
Electricity production	EGy electricity electronically monitored (excluding EG, manually monitored)	EG=EL ex.lfg-El imp	kWh	4896490
Electricity production	EG manually monitored	see. Worksheet: Total yearly electricity calculation	kWh	484691
Total Electricity production	EGy	Total Egy=EGy electricity electronically monitored + EG manually monitored	kWh	5381181
Emission factor	CEF electricity		tCO2e/kWh	0.000785
Emission reduction from electricity production	CO2 av.y	CO2 avoided, y= EGy * CEFelectricity	tCO2	4224
Global warming potential of CH4	GWP ch4		tCO2e/tCH4	21

Methane destroyed per year due to regulatory requirements	**Mdreg.y**	**MDreg,y = MDproject,y * AF**	**tCH4**	**0**
Methane destroyed per year:	**MDproj**	**MD project=MD flared+MD electricity-MD hagal**	**tCH4**	**805**
Emission reduction from CH4 destruction		**(MDproject,y - MDreg,y) * GWPCH4**	**tCO2**	**16909**
Emission reduction per year:	**ER y**	**ERy = (MDproject,y - MDreg,y) * GWPCH4 + EGy * CEFelectricit,y**	**tCO2**	**21133**

D.2. Description and consideration of measurement uncertainties and error propagation:

The maximum possible error of measuring instruments was used for correction of methane mass calculations, and electricity production, as most conservative.
The total electricity production was cross checked with official bills and invoices of Israel Electrical Company.

D.3. GHG emission reductions (referring to B.2. of this document):

D.3.1. Project emissions:

Project emissions exempt from the auxiliary electricity consumption are considered to be zero. The project

emissions from the project activity are already considered in the calculation of the baseline emissions. The project emissions related to electricity consumption through project activities are deducted from the baseline emissions

D.3.2. Baseline emissions:

D.3.3. Leakage:

According with ACM0001 – version 04, no leakage needs to be considered.

D.3.4. Summary of the emissions reductions during the monitoring period:

Parameter	Units	Total
Emission reduction from Methane destruction	tCO2	16909
Emission reduction from Electricity production	tCO2	4224
Total Emission reduction	tCO2	21133

Annex 1

Definitions and acronyms

...

CDM Clean Development Mechanism
CDM-EB Clean Development Mechanism Executive Board
PDD Project Design Document
CER Certified Emission Reduction
GHG Greenhouse Gas
GWP Global Warming Potential
CH4 Methane
EF Grid CO2 Electricity Emission Factor

Annex 2

Energy and material flowchart including metering positions

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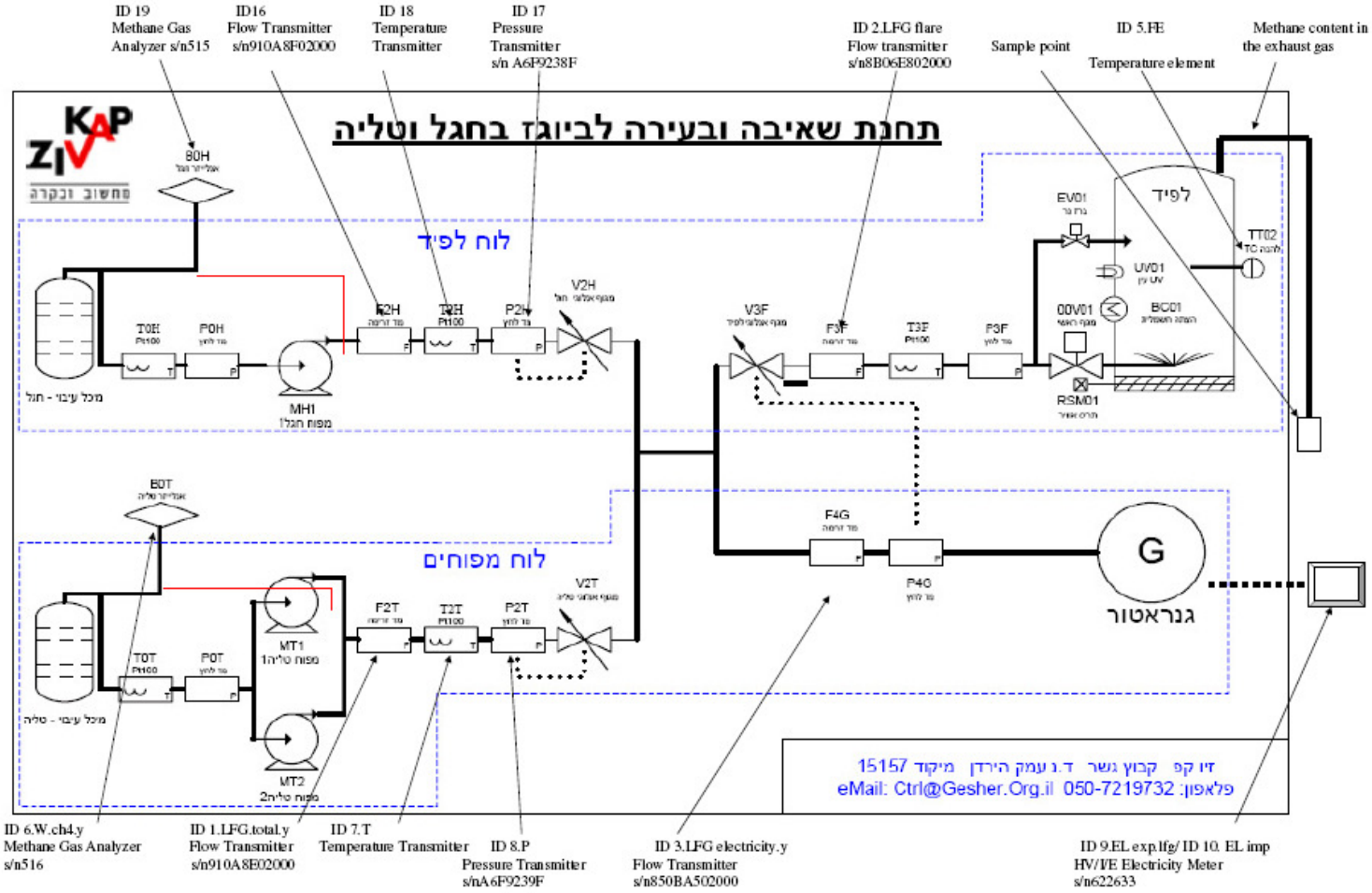
ID 19
Methane Gas
Analyzer s/n515
ID16
Flow Transmitter
s/n910A8F02000
ID 18
Temperature
Transmitter
ID 17
Pressure
Transmitter
s/n A6P9238F
ID 2.LFG flare
Flow transmitter
s/n8B06E802000
Sample point
ID 5.FE
Temperature element
Methane content in
the exhaust gas
תחנת שאיבה ובעירה לביוגז בחגל וטליה
לוח לפיד
לפיד
לוח מפוחים
גנראטור
G
ID 6.W.ch4.y
Methane Gas Analyzer
s/n516
ID 1.LFG.total.y
Flow Transmitter
s/n910A8E02000
ID 7.T
Temperature Transmitter
ID 8.P
Pressure Transmitter
s/nA6F9239F
ID 3.LFG electricity.y
Flow Transmitter
s/n850BA502000
ID 9.EL exp.lfg/ ID 10. EL imp
HV/LE Electricity Meter
s/n622633

Annex 3

Monitoring manual

The monitored data stored on the follow levels:

1st level: Data storage on meters

2nd level: Data recording on the plant operation journal

3rd level: Data distance reading and electronically storage

1. : Data storage on meters

Flow meters:
There are electronic counters built in the flow meters. During any change of the meters a protocol will be immediately issued for the verifier.

The methane analyzer:
An internal electronic storage for the data of the last year of operation.

Flare operation :
The operation hours of the flare counted by an operation hour counter of Plant PLC, alternatively the regular automatic recording will give a very safe indication about the flare performance by regular recording of the flare operation temperature.

Engine operation hours:

The operation of the engine recorded by an operation hour counter of the engine(s); alternatively the regular automatic recording will give a very safe indication about the engine performance by regular recording of the produced electric power.

Electric meters:
The metered data is supported by values from official invoices.

2. **Data recording on the Plant Operation Journal**

The operator's personnel record **daily** the following data in the plant operation journal, according to Plant Monitoring Plan:

- Time and date
- Name of person that conducts the data audit
- Counter of flow meter 1(general volume from Talia)
- Volume flow from Talia
- Optional counter of flow meter 1b (general volume from Hagal)
- Volume flow from Hagal
- Counter of flow meter 2 (landfill gas to the flare)
- Volume flow from Flare
- Counter of flow meter 3 (landfill gas to the generator)
- Volume flow from Engine
- Actual % of methane in the landfill gas from Talia
- Actual % of methane in the landfill gas from Hagal
- Actual temperature of the landfill gas from Talia
- Actual temperature of the landfill gas from Hagal
- Actual pressure of the landfill gas from Talia
- Actual pressure of the landfill gas from Hagal

- Flare working status-flare temperature
- Gas Engine working status (Nr. of overall operation hours, power production)
- Counter of power meter for energy consumption from the grid
- Counter of power meter for energy delivery to the grid
- Any calibration or service works on the metering devices , as service notes
- Any other relevant actions and findings , as service notes

The data in the plant operation journal will be audited once a month by the operator management. Regular cross checks with the data on the meters and the data electronically stored serve as a tool for controlling the accuracy.
The operator management will issue a protocol each month and remove the operation journal from the plant to the office of the operator.
In the monthly protocol also the data from the billing of the local power utility will be recorded.
The monthly protocol will be photocopied and the copy placed in the plant while the original will stay at the office of the operator.
The original operation journal as well as the billing documents for power delivery will stay at the operators office at least 2 years after the end of the project activity.
The copies of the monthly protocol will stay at the plant until the end of operation.

3.Data distance reading and electronically storage

A PC compute the norm m^3 for methane out of the volume of landfill gas, the pressure, temperature and percentage of methane content in the landfill gas.
It possible to access this data by the internet any time for the purpose of optimization of the plant operation or verification. The data security of the server is very high due to professional operation and regular data backup.
However the data security of the build in meters or the plant journal is higher.

Prior to annual verification the online storage data has to be cross checked with the data recorded in the plant orations journal. In case of differences the data in the plant journal and on the meter counters has priority.

4. **Procedures in case of loss of data:**

The monitoring devices must be replaced /repaired as soon as possible on cause of failure, but during of shut off period, the follow activity to be done for keeping of the main monitored data:

Failure of flow meters:
It is possible to reconstruct the data of a single flow meter out of the data from the other remaining flow meters:
General flow meter = flow meter flare + flow meter engine
Flow meter flare= General flow meter – flow meter engine
Flow meter engine= general flow meter - flow meter flare
Any failure of a single meter will be recorded immediately after discovery in the plant operation journal.

Failure of the methane analyzer:
As the average methane content of the landfill gas will change only very slowly due to changing seasons or the reduced biologic activity of the waste, it is possible to estimate with high accuracy that the methane concentration in the landfill gas would be the same average value as in the previous week before the failure.
Any failure of the methane analyzer will be recorded immediately after discovery in the plant operation journal and a replacement ordered as soon as technically possible.
During the time of malfunction the methane content of the landfill gas for Talia field and Hagal field will be measured two times a day by a Portable Methane Analyzer (PMA) and recorded in the Pant Operation Journal.
During time of calibration, the last measured value will be used for ongoing calculations of methane concentration during the time of calibration

Failure of pressure or temperature indicators:
The failure of these devices is immediately visible at least when a new shift will check the meter data.
As a landfill gas extraction plant will work under similar conditions for very large periods of time, the average data of the last week before failure can be used without compromising conservativeness of the measurement.
In case a methane meter, temperature meter or pressure meter will fail, it is possible to use the average value of the previous week before the meter failure for electronic calculation of the Methane mass until the meter has been replaced. Any meter malfunction has to be recorded as well how the data were reconstructed.

Failure of the flare:
Any failure of the flare to regularly ignite the landfill gas will cause an automatic shutdown of the blower. This security feature is built in by the producer of the flare and will not be altered. It is therefore impossible to emit landfill gas through the flare without combustion. However it would be still possible to use the gas engine to combust landfill gas.
Any failure of the flare system will be recorded immediately after discovery in the plant operation journal.
The continuously recording of the flare temperature will exactly indicate the working conditions of the flare.

Failure of the temperature meter for flare temperature:
This value is not used for the determination of the amount of emission reductions. It is only used as additional value for quality control of the operation. In case of failure it is replaced as fast as technically feasible. Any failure of the flare system will be recorded immediately after discovery in the plant operation journal.

Failure of the gas engine:
In case the gas engine is out of order or during maintenance, landfill gas can be combusted only through the flare. Malfunctioning or idleness of the engine is easy detectable by comparing the flow rate and the power production that is automatically recorded.

Failure of the electric power meters:

The electric power meters are subject to independent control by the local utility. It is possible to assume that the utility will use a very conservative approach to calculate the amount of energy delivered to the grid, respectably the amount of power delivered to the plant.
The regular billing sheets are therefore always the resource for valid data.

Failure of the PLC:
The data recorded by hand on paper will be used to calculate for a limited time the mass of methane. Any failure of panel PC will be recorded immediately after discovery in the plant operation journal

5.Monthly report

The monthly report consist the Monthly Monitoring Report and official billing and invoice document of IEC.

-the monthly streamline data monitoring report created by program Fakel, installed on the industrial PC .
The reports, as XLS files are ready for printout, and the printout should be attached to the monitoring folder.

-the monthly report organized on the Monthly Report template file, provided auto coping and calculation of the monthly emission reductions, as per CDM-PDD , pages 21 and 22

-the copies of official billing and invoice document of IEC should be done by site manager and attached to the monitoring folder.

6. Yearly report.

The yearly report and calculations to be done according to CDM-PDD –Version 2 of Talia Landfill Gas and Electricity Production.

The yearly report including monitoring of CH4 content in the exhaust gas of flare, with attachment of test report.

Annex 4

Monthly Report template file Manual

The advised template created on the Excel format, and able to use the monitored data form the PLC files, and provide all required calculation (mass of methane, volume and mass totalizing, electricity totalizing, operating hour's calculation, ER calculation, ets.)

The follow, automatically recorded data, copied from the PLC files to the "Monthly Report template" file.

1 Date and Time of record

Date	Time

2. Monitored content of Methane, Oxygen, LFG temperature, LFG pressure and LFG volume of Hagal landfill

Hagal				
19		18	17	16
B2H	B2H	T2H	P2H	F2H
CH4[%]	O2[%]	T-Gas[°C]	P-Gas[hPa]	Vol. Hagal[m3]

3. Monitored content of Methane, Oxygen, LFG temperature, LFG pressure and LFG volume of Talia landfill

Talia				
6.W ch4.y		7.T	8.P	1.LFG total.y
B2T	B2T	T2T	P2T	F2T
CH4[%]	O2[%]	T-Gas[°C]	P-Gas[hPa]	Vol. Talia[m3]

4.Monitored Barometric pressure

Hagal/Talia
B2H
Barom pr. Abs [hPa]

5.Monitored LFG volume to Generator, imported and exported electricity

Generator			
3.LFG electricity.y	10.EL imp	9.EL ex.lfg	
F4G	HV/I/E	HV/I/E	
Vol. Gen.[m3]	P_in[Kwh]	P_out[KWh]	

6. Monitored LFG flow to Flare.

Flare		
2.LFG flare		5.FE (1)
F4F		TT02
Vol. Flare l[m3]		T1 Flare [°C]

The follow data automatically calculated by the build in formulas in the "Monthly Report template" file:

7.Methane mass supplied from Hagal landfill, calculated every 1 hour

MD hagal.n = (**Vol** hagal.n - **Vol** hagal.n-1) * **CH4**%.n/**100** / * **D** ch4.hagal.n
Dch4.n = 0.0007168 * (P gas.hagal.n + P barom.n)/1013 * 273.15/(T gas.hagal.n + 273.15)
As per page 21 and 22 of CDM-PDD

Hagal
MD hagal
Mass CH4 Landfill [tonn]

8. Methane mass supplied from Talia landfill, calculated every 1 hour

MD talia.n = (**Vol** talia.n - **Vol** talia.n-1) * **CH4**%.n/**100** / * **D** ch4.talia.n
Dch4.n = 0.0007168 * (P gas.talia.n + P barom.n)/1013 * 273.15/(T gas.talia.n + 273.15)
As per page 21 and 22 of CDM-PDD

Talia
MD talia
Mass CH4 Landfill [tonn]

9. Methane mass, supplied to Generator.

The value automatically calculated ones per month by the follow formula:
MD gen.m = (**MD** hagal.m + **MD** talia.m) * **LFG** gen.m / (**LFG** gen.m + **LFG** flare.m)

Generator
MD electricity
Mass CH4 Generator [tonn]

10.Operating hours of Generator (proving calculation only).

The value 1 hour or 0 hour automatically calculated every 1 hour , by checking of the electricity export, different from 0.
If **EI** exp.n - **EI** exp.n-1 > 0, value = 1, if **EI** exp.n - **EI** exp.n-1 = 0, value.n = 0

Generator
9.EL ex.lfg
Gen Operating hours

Finally, sum of the monthly operating hours automatically calculated

11. Methane mass, supplied to Flare.

The value automatically calculated ones per month by the follow formula:
MD flare.m = (**MD** hagal.m + **MD** talia.m) – **MD** gen.m

Flare

MD flared
Mass CH4 Flare [tonn]

12.Operating hours of Flare (proving calculation only).

The value 1 hour or 0 hour automatically calculated every 1 hour , by checking of the flare temperature.
If **T** flare.n > 500 deg C, value.n = 1, if **T** flare.n < 500 deg.C , value.n = 0

Flare
5.FE (1)
Operating hours

Finally, sum of the monthly operating hours automatically calculated.

13. According to procedure of emergency monitoring, the fail data, received from PLC, by failure of any measurement instrument (like, analyzer, PLC, ets.), data in the “Monthly Report template” file, filled manually, consistently, on base of the “Daily Operation Journal”, and covered by Protocol.

14. Total error calculation.

14.1Total error of mass of methane collected from sourses (Talia landfill, Hagal landfill) calculated as per follow formula:

E total = sqrt (Flow meter error^2 + Methane meter error^2 + Pressure meter error^2 + Temperature meter error^2)

14.2 Total error of electricity meter equal maximum error of meter.

Annex 5

Quality Control Manual

Quality control and quality assurance are carried out by the following methods:

1.The project implementing organization consist operating personnel and management. Both will be assigned by Madei Taas Monitoring superviser. and the Plant Supervisors of the Talia and Hagal landfill.

2.The follow written procedures prepared for operating facilities.
2.1 Procedures containing daily work schedules advised by Monitoring Manual, Monitoring Plan and Daily Journal.
2.2 Periodic maintenance procedure advised by Maintenance Plan and Maintenance Journals.
2.3 All training was supplied before the project's implementation.
The following table presents the employees were hired during the Monitoring Period – all of them received the proper training.

Employee	**Function**
David Alter	**Talia plant supervisor**
Roi Federman	**Hagal plant supervisor**
Alex Voskoboinik	**Madei Taas monitoring supervisor**

2.4Talia and Hagal supervisors work according to the above procedures and report results to Madei Taas Monitoring supervisor
2.5 Madei Taas Monitoring supervisor check reports from Talia and Hagal supervisors and determine whether there are problems according to the procedures. If problems are found in such checks, Madei Taas Monitoring supervisor implement the appropriate countermeasures with appropriate timing and create Protocol.
Madei Taas Monitoring supervisor file and store reports from Plant supervisors, according to the procedures.
2.6 Madei Taas Monitoring supervisor regularly patrol and visit work areas to audit that work is being appropriately implemented by Plant supervisors according to the procedures. If problems are found in such audits, management implement appropriate countermeasures with appropriate timing and create Protocol.
2.7 In the event of accidents (including the unforeseen release of GHG), Madei Taas Monitoring supervisor ascertain the causes and implement countermeasures, including specific operation procedures for the Plant supervisors.
2.8 Measuring instruments periodically and appropriately calibrated according to the procedures. Calibration timing and methods must be in accordance with the monitoring plan. Calibration procedure must be recorded in Monitoring journal and Calibration Certificate should be applied
2.9 Monitoring data, constantly recorded by electronic means, monthly cross checked for completeness and electronically transmitted data compared with actual copies of the Daily journals. Any kind of inconsistency to be investigated by Madei Taas Monitoring supervisor .
2.10 The Monthly report created on base of Monthly Report Template Excel file by Madei Taas Monitoring supervisor .

3. Measured data will be disclosed upon any request and are open to public comment. Received comments and the steps taken in response to them will also be disclosed.

Annex 6

Israeli grid-emission factor calculation

FOOLWING ARE SELECTED DATA AS OF END OF DECEMBER 2006:
Data from IEC web sit :
http://www.israel-electric.co.il/bin/en.jsp?enDispWhat=Zone&enZone=SelDIRR&enDispWho=SelDIRR&enPage=IRRWPage&enDisplay=view&

GENERATING SYSTEM	Installed Capacity	10,899 MW
	Peak Demand	9,450 MW
	Electricity Generated	50,235 (Million KWH)
ELECTRICITY CONSUMPTION	Total consumption	46,175 (Million KWH)
	Average consumption growth (1997-2006)	4.9%
	Total revenues	17,590 Million N.I.S.
		4,163 Million U.S.D
	Average electricity price	38.98 Agorot/KWh
		9.2 Cents
	Total consumers	2.4 Million
FUEL CONSUMPTION (Thousand Tons)	Fuel oil	665
	Coal	12,519
	Gas oil	628
	Natural Gas	1,530
MANPOWER	Permanent employees	9,782
	Temporary employees	2,894

Volume of produced electric energy:

As per Israel electric statistic report, the total 2006 Electricity production was : **50,238 Million kWh**

CO_2 intensity of the Israeli grid in 2006

Conventional Energy Production
The following are Israeli grid emission factor calculation is made:

		ktons	NCV TJ/ktonne	energy TJ	EF tC / TJ	Oxid	emissions ton C	**emissions ton CO2**
fu	fuel oil	665	42.54	28289.1	20	0.99	560124.18	**2,053,789**
C	coal	12519	26.63	333380.97	25.8	0.98	8429204.445	**30,907,083**
gas	gas oil : comb. Cycle and in industrial turb'	628	43.33	27211.24	20.2	0.99	544170.3775	**1,995,291**
Na	Natural gas	1530	47.31	72384.3	17.2	0.995	1238784.91	**4,542,211**
T	**Total Emissions :**							**39,498,374**

Were The following data were taken from IPCC 1996 reference manual:
TJ/K Ton : Tables 1-2 , 1-3 .
Energy per product: Table 1-1
Emission Factor per products: Table 1-1
Oxide factor per product: Table 1-6

Capacity of renewable power production:

Company	Location	Power MW	Technology	Yearly hours operation	Total millions kwh per year	Tons CO2 per year
Metzad Atarot Ltd	Kefar Hanasi	2.5	Hydro	8000		0
Water company Hatzbani	Gesher Senir	2.2	Hydro	8000		0
Afiki Maim 50	Beit Shean	0.2	Hydro	8000		0
Afiki Maim 200	Beit Shean	0.35	Hydro	8000		0
Afiki Maim revaya 4	Beit Shean	0.35	Hydro	2000	SUM 44,8	0
Golan winds	Tel Katif	0.225	Wind	2000		0

Mei Golan Wind power	Ramat Hagolan	6	Wind	8000	SUM 12,45	0
Arrow Ecology	Hiria	1.03	Biogas	8000		0
Green electricity Ltd	Dudaim	2.128	Biogas	8000	SUM 25,26	0
SUM					82,5	0

Source: Ministry of National infrastructures of Israel http://www.mni.gov.il/mni/Energy/Electricity/ElectricityIndependet/

- Hydro power runs all over the year therefore taken 8,000 yearly operation
- Wind power factor in the Golan Heights is about 25% of the yearly operation hours, therefore for taken 2000 hours per year.
- Biogas runs 8000 hours per year.
- Emission of Biogas/landfill gas with about 50% CH4 is calculate with 0.825 TCO2/Mwh

Total electrical Energy produced by IEC at 2006 : 50,235 Million kwh

Total Energy produce for 2006 :

50,235 Million kWh + 82.5 Million kWh = **50,318** Million kWh .

Total Emission for 2006 :

39,498,374 Tons/CO2

Calculation of CO_2 intensity:

So we can calculate the total emission factor of the Israeli grid base of 2006 figures:

39,498,374 Tons/CO2 / **50,318** Million kwh = **0.000785 ton CO2/kwh**

Annex 7

Summery of collected data 11.03.2007-31.12.2007 on the Excel file "Monthly and Yearly Report 2007 rev 16 corrected".