

Andijan District Heating Project Monitoring Plan

Annex 4 to PDD – Draft Final Report, 10 March 2005

Preface

This Monitoring Plan applies to the World Bank's Prototype Carbon Fund (PCF) and European Bank for Reconstruction and Development (EBRD) Andijan District Heating Project. It provides the mandatory set of project monitoring and verification procedures to be followed by specific Project entities as well as the different roles and responsibilities of the entities in the Andijan Project such that the greenhouse gas emission reductions resulting from the Project can be certified under the Clean Development Mechanism. All PCF carbon reduction investment projects must have a MP to ensure that the projects meet the requirements of the Kyoto Protocol, under Article 12, that emissions reductions be *real, additional, and verifiable*.

Acronyms and Abbreviations

ADHC	Existing Andijan District Heating Company
AIJ	Activities Implemented Jointly (under the UNFCCC)
BAU	Business as Usual
BLS	Baseline study
CDM	Clean Development Mechanism (under the UNFCCC)
CER	Certified Emission Reductions
CIS	Commonwealth of Independent States
CoM	Cabinet of Ministers of Uzbekistan
CO ₂	Carbon Dioxide
DH	District heating
DHS	District heating system
DSM	Demand side measures
EBP	Ernst Basler + Partners Ltd.
ER	Emission Reduction
ERPA	Emission Reduction Purchase Agreement
ERU	Emission Reduction Units
ERUPT, CERUPT	(Certified) Emissions Reduction Unit-Procurement Tender is the Dutch Ministry of Economic Affairs Program for purchasing ERUs and CERs from Joint Implementation and CDM projects
FSU	Former Soviet Union
GHG	Greenhouse Gas
GOU	Government of Uzbekistan
HFO	Heavy fuel oil
HITS	“Hamkor Issyklyk Taminot Servise”, see NEWCO
IBRD	International Bank for Reconstruction and Development (World Bank)
IDA	International Development Agency (World Bank Group)
IEA	International Energy Agency
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
JI	Joint Implementation (under the UNFCCC)
KP	Kyoto Protocol
LFO	Light fuel oil

M&V	Monitoring and Verification
ME	Ministry of Energy
MP	Monitoring Plan
MVP	Monitoring and Verification Protocol
NEWCO	New District Heating Company (“Hamkor Issyklyk Taminot Servise (HITS)”), will operate the new DHS of the project
NG	Natural gas
ODA	Official Development Assistance
PCF	Prototype Carbon Fund
SP	Sub-project, consisting of 1 to 3 nano-regions
UNFCCC	United Nations Framework Convention on Climate Change

Units of Measure

a	Years
bbl	Barrels
d	Days
GJ	Gigajoule (10^9 Joules)
GW	Gigawatt (10^9 Watts)
GWh	Gigawatt hour (10^9 Watt hours), equals 3.6 TJ
K	Kelvin (equals the temperature in Centigrade plus 273.15)
kg	Kilogram (1000 grams)
kW	Kilowatt (1000 Watts)
kWh	Kilowatt hour (1000 Watt hours); equals 3.6 MJ
m ³	Cubic meter
MJ	Mega-joule (10^6 Joules)
kV	Kilovolt (1000 Volts)
kVA	Kilovolt Amperes (1000 Volt Amperes)
MW	Megawatt (1 million Watts)
MWh	Megawatt hour (1 million Watt hours)
Nm ³	Normal cubic meter
Sum	Sum, national currency of Uzbekistan (1 USD = 844 Sum official annual average buying and selling exchange rate at exchange office (cash) in 2001)
t	Metric tonne (1000 kilograms)
tC	Tonnes of Carbon
tCO ₂	Tonnes of Carbon Dioxide
TJ	Tera-joule (10^{12} Joules)
TWh	Terawatt hours (10^{12} Watt hours)
USD	US Dollars
yr	Years

Contents

Acronyms and Abbreviations	2
Units of Measure.....	4
1 The Monitoring Plan	1
1.1 Purpose of the MP	1
1.2 Use of the MP by the NEWCO Operator.....	2
1.3 Structure of the MP	3
1.4 Baseline and Sub-projects	3
2 Operational and Monitoring Obligations	4
2.1 Operational Obligations.....	4
2.1.1 Operator (NEWCO).....	4
2.1.2 Government of Uzbekistan.....	4
2.2 Data Requirements and Project Database.....	6
3 The Andijan Project MP Workbook	16
3.1 Introduction	16
3.2 Summary of the workbook's content.....	16
3.3 Emissions reductions calculations	17
3.4 Instructions on workbook use for operator	18
3.4.1 Conversion factors and assumptions (Sheet 3)	18
3.4.2 SP 1-12 Initial inputs (Sheets 4-15)	18
3.4.3 SP 1-12 Annual and monthly inputs (Sheets 4-15)	19
3.5 Monitoring plan summary worksheet	22
4 Management and Operational Systems MP.....	24
4.1 Allocation of Project Management Responsibilities	24
4.2 Management and Operational Systems.....	25
4.2.1 Monitoring System	25
4.2.2 Verification and Commissioning.....	25
4.2.3 Data Quality Assurance	26
4.2.4 Performance Monitoring and Reporting	27
4.2.5 MP Training and Capacity Building	28
4.2.6 Non-Conformance Event Handling	28
4.2.7 Contingency Planning	29
4.2.8 Summary	29

1 The Monitoring Plan

1.1 Purpose of the MP

In the context of the Clean Development Mechanism (CDM) of the Kyoto Protocol, the monitoring of a CDM Project Activity refers to collection and archiving of all relevant data necessary for determining the baseline, measuring anthropogenic emissions by sources of greenhouse gases within the project boundary of the CDM project activity and determining leakage, as applicable.

This Monitoring Plan (MP) defines a standard against which the Andijan District Heating Project performs in terms of its greenhouse gas (GHG) reductions, in conformance with all relevant CDM project monitoring criteria. As such the MP, after its validation, will be an integral part of the contractual agreement between the Prototype Carbon Fund (PCF) and NEWCO, the operator of the new Andijan DHS.

The MP forms part of the Andijan project design document (PDD). It builds on the baseline scenario and the monitoring methodology identified in the PDD. The MP provides the basis for the projection of the GHG emissions reductions (ERs) that the project expects to generate over its lifetime.

The MP also provides a practical framework for the collection and management of project performance data which will be used for retrospective verification of actual emission reductions generated. Verification is the periodic auditing by a third party of monitoring results, the assessment of achieved ERs and of the project's continued conformance with all relevant project criteria. This MP does not contain specific guidelines on emission reduction auditing and verification, but it provides sufficient detail on the project structure, the proposed data monitoring methodologies and relevant operational issues, to allow an independent verifier to develop suitable auditing and verification procedures for the Andijan Project, such as provided for in the validation and verification manual for CDM and JI projects (cf. www.vvmanual.info).

1.2 Use of the MP by the NEWCO Operator

The Andijan MP is a working document that identifies the key project performance indicators and sets out the procedures for tracking, monitoring and calculating the impacts of the project, in particular with respect to the project's net emission reductions.

This MP must be used by the NEWCO operator and management when planning and implementing the project and during the project's operation. Adherence to the instructions in the MP is necessary for the project operator successfully to measure and track the project impacts and prepare for the periodic audit and verification process that must be undertaken to confirm the achieved emission reductions. The MP is thus the basis for the production and delivery of emission reductions to the PCF or other buyers, and for any related revenue stream that the operator expects to receive.

The MP assists the operator in establishing a credible, transparent, and adequate data measurement, collection, recording and management system to successfully develop and maintain the proper information required for an audit of the collected information and for the verification and certification of the achieved ERs and other project outcomes. Specifically, the Andijan Project MP provides the requirements and instructions for:

- establishing and maintaining the appropriate monitoring system including semi-automated spreadsheets for the calculation of emission reductions
- implementing the necessary measurement and management operations; and
- preparing for the requirements of independent, third party verification and audits.

The MP ensures environmental integrity and accuracy of crediting ERs by only allowing actual emission reductions to be accounted for after they have been achieved. The MP must therefore be used throughout the life of the project by being:

- adopted as a key input into the detailed planning of the project; and
- included in the operational manuals of the Andijan Project.

The MP can be updated and adjusted to meet operational requirements, provided such modifications are approved by the Andijan Project verifier during the process of initial or periodic verification. In particular, any shifts in the applicable baseline that are identified by following this MP may lead to such amendments, which may be mandated by the verifier.

1.3 Structure of the MP

The Andijan Project Monitoring Plan (MP) document contains the following parts:

- **Chapter 1** provides an introduction to the MP.
- **Chapter 2** contains instructions regarding the operational and monitoring obligations the NEWCO operator is expected to assume.
- **Chapter 3** presents the functioning of the Andijan MP electronic workbook. The workbook is implemented as an Excel spreadsheet and is an integral part of the MP. It automatically calculates emission reductions based on input data provided by the operator's data base for every sub-project.
- Finally, **Chapter 4** explains the management and operational systems that need to be put in place to ensure consistent, high quality monitoring that will support the needs of the independent verifier.

1.4 Baseline

The Andijan district heating project and its baseline and system boundaries are described in detail in the PDD.

2 Operational and Monitoring Obligations

In order to achieve verifiable emissions reductions from the Andijan Project, the operator –NEWCO – will have to fulfil certain operational and data collection obligations. These obligations shall be simplified by the use of the Monitoring Plan Workbook (an Excel spreadsheet, described in detail in the following chapter) which requires the provision of site specific data to enable emission reductions calculations which must be subsequently produced to satisfy the demands of the independent verifier.

This chapter sets out the key parameters defining the performance of the Andijan Project. The data that must be acquired on a regular basis to fulfil the requirements of the MP, and any operational obligations placed on the NEWCO management.

2.1 Operational Obligations

2.1.1 Operator (NEWCO)

The operator should:

- establish/refurbish the district heating system
- establish and maintain the monitoring system and implement the MP in the companies operational policies
- monitor and record data regularly as indicated and calculate emission reductions using the provided tool

2.1.2 Government of Uzbekistan¹⁾

The availability of robust electricity generation emission factors is an important prerequisite for the reliable calculation of resulting emission reductions. The Government of Uzbekistan should be recommended to publish at least every seven years official data regarding:

-
- the electricity emission factors [gCO₂/kWh] of the national public grid (annual average),
 - electricity exports and imports (annual average and for winter term October to March),
 - the share of hydro power stations in the mix [%] of the national grid (annual average and average for winter term October to March).

A short technical report justifying the data should be made available at least every seven years to the operator (NEWCO), the PCF and the verifier.

1) Subject to CDM policy of and agreements with Government of Uzbekistan.

2.2 Data Requirements and Project Database

The operator (NEWCO) is also required to comply with the data collection, testing and analysis, and data management obligations of this MP. The operator must integrate the following data collection requirements into the company's data basis and information collection policies.

All data monitored and required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of CERs for this sub-project, whatever occurs later.

The following operational factors should be collected and used to determine the emissions after project implementation. For some of the operational factors, default values are defined in Section 3.4.3 below that should be used if data is not available.

Note on monitoring frequency: Generally, monitoring should be in line with planned meter readings and billing cycles as much as possible to minimize CDM induced monitoring cost. Therefore, operational factors for which the table below foresees a monthly monitoring may also be monitored in a frequency that is in line with usual meter reading and agreed between project parties, i.e. on a quarterly basis, if quality of monitored data can be assured. In this case, the MP Workbook would have to be adapted accordingly.

The following Tables from the PDD Section D provide an overview on the data to be collected.

Data to be collected in order to monitor emissions from the <u>project activity</u> , and how this data will be archived:								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
1.	$F_{LFO,DHS}$	Operator: LFO consumption in new DHS (sum of all boilers)	t	m	Monthly	100%	Electronic	Recorded from main fuel meters and documented by fuel purchasing records
2.	NCV_{LFO}	Fuel supplier: LFO net calorific value	GJ/t	m	Annually	100%	Electronic	More frequent if change of supplier or origin. If no local data available, IPPC values can be used as default.
3.	$EF_{CO_2,LFO}$	Fuel supplier: LFO CO ₂ emission factor	tCO ₂ /GJ	m	Annually	100%	Electronic	More frequent if change of supplier or origin. If no local data available, IPPC values can be used as default.
4.	$OXID_{LFO}$	Operator: LFO oxidation factor	-	m	Annually	100%	Electronic	If no local data available, IPPC values can be used as default.
5.	$F_{NG,DHS}$	Operator: NG consumption in new DHS (sum of all boilers)	Nm ³	m	Monthly	100%	Electronic	Recorded from main fuel meters and documented by fuel purchasing records
6.	NCV_{NG}	Fuel supplier: NG net calorific value	MJ/Nm ³	m	Annually	100%	Electronic	More frequent if change of supplier or origin. If no local data available, IPPC values can be used as default.
7.	$EF_{CO_2,NG}$	Fuel supplier: NG CO ₂ emission factor	tCO ₂ /GJ	m	Annually	100%	Electronic	More frequent if change of supplier or origin. If no local data available, IPPC values can be used as default.

8.	$OXID_{NG}$	Operator: NG oxidation factor	-	m	Annually	100%	Electronic	If no local data available, IPPC values can be used as default.
9.	$ELEC_{DHS_PA,y}$	Operator: electricity consumption new DHS	MWh	m	Monthly	100%	Electronic	Recorded from main electricity meters and documented by electricity purchasing records
10.	$HEAT_{Boiler}$	Operator: boiler heat output to network	GJ	m	Monthly	100%	Electronic	As measured by the difference in temperature between water entering and exiting the boilers and by the amount of water; data used for cross-checking only.
11.	$HEAT_{PA_BLS-HH,y}$	Operator: heat delivered in year y to consumers that are connected to the new DHS and that have been connected to the old DHS before the start of the project activity	GJ	m	Monthly	100%	Electronic	As measured by the difference between water entering and exiting the Apartments and the temperature and amount of hot tap water supplied

Table 1: Data to be collected or used in order to monitor emissions from the sub-projects, and archiving.

The specific emission factor of the baseline technology is determined before the start of the project activity on the basis of fuel use / efficiency / performance data of heating systems over two or more heating season or through the use of IPCC default data and estimates as indicated in Table 2. The recording frequency is also indicated in Table 2.

Relevant data necessary for determining the <u>baseline</u> of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
12.	$F_{HFO,DHS}$	Operator: HFO consumption in old DHS	t	m	Monthly in period before project activity start	100%	Electronic	DHS: Recorded from main fuel meters and documented by fuel purchasing records
13.	NCV_{HFO}	Fuel supplier: HFO net calorific value	GJ/t	m	Annually in period before project activity start	100%	Electronic	More frequent if change of supplier or origin (each time supplier/origin is changed). If no local data available, IPPC values can be used as default.
14.	$EF_{CO_2,HFO}$	Fuel supplier: HFO CO ₂ emission factor	tCO ₂ /GJ	m	Annually in period before project activity start	100%	Electronic	More frequent if change of supplier or origin (each time supplier/origin is changed). If no local data available, IPPC values can be used as default.
15.	$OXID_{HFO}$	Operator: fossil	-	m	Annually in	100%	Electronic	If no local data available, IPPC

Relevant data necessary for determining the baseli ne ing of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
		fuel(s) / oxidation factor			period before project activity start			values can be used as default.
16.	$F_{LFO,DHS}$	Operator: LFO consumption in old DHS (sum of all boilers)	t	m	Monthly in period before project activity start	100%	Electronic	DHS: Recorded from main fuel meters and documented by fuel purchasing records
17.	NCV_{LFO}	Fuel supplier: LFO net calorific value	GJ/t	m	Annually in period before project activity start	100%	Electronic	More frequent if change of supplier or origin. If no local data available, IPPC values can be used as default.
18.	$EF_{CO_2,LFO}$	Fuel supplier: LFO CO ₂ emission factor	tCO ₂ /GJ	m	Annually in period before project activity start	100%	Electronic	More frequent if change of supplier or origin. If no local data available, IPPC values can be used as default.
19.	$OXID_{LFO}$	Operator: LFO oxidation factor	-	m	Annually in period before project activity start	100%	Electronic	If no local data available, IPPC values can be used as default.
20.	$F_{NG,DHS}$	Operator: NG consumption in old DHS	Nm ³	m	Monthly in period	100%	Electronic	DHS: Recorded from main fuel meters and documented by

Relevant data necessary for determining the baseli ne ing of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
		(sum of all boilers)			before project activity start			fuel purchasing records
21.	NCV_{NG}	Fuel supplier: NG net calorific value	MJ/Nm ³	m	Annually in period before project activity start	100%	Electronic	More frequent if change of supplier or origin. If no local data available, IPPC values can be used as default.
22.	$EF_{CO_2,NG}$	Fuel supplier: NG CO ₂ emission factor	tCO ₂ /GJ	m	Annually in period before project activity start	100%	Electronic	More frequent if change of supplier or origin. If no local data available, IPPC values can be used as default.
23.	$OXID_{NG}$	Operator: NG oxidation factor	-	m	Annually in period before project activity start	100%	Electronic	If no local data available, IPPC values can be used as default.
24.	$F_{NG,IHD}$	Expert estimate: NG consumption in individual heaters (IHD)	Nm ³	e	Annually in period before project activity start	100%	Electronic	IHD: Expert estimate (See steps 3 and 5 in Section B.2.)
25.	$ELEC_{DHS,BLS}$	Operator: electricity consumption old DHS	MWh	m	Monthly in period before	100%	Electronic	Recorded from main electricity meters and documented by electricity purchasing records

Relevant data necessary for determining the baseli <u>ne</u> of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
					project activity start			
26.	$\eta_{i,DHS}$	Expert estimate based on site visit: overall DHS specific system efficiency	-	m/e	Once before project activity start	Representative samples of network	Electronic	<p>Option given in the end of Section B.2.3. in the related new monitoring methodology is used: old DHS efficiency is estimated because data on heat supplied is not available.</p> <p>Overall DHS specific system efficiency of old system is conservatively estimated based on available data and measurements on efficiencies of boiler, network insulation, network leakage etc. See steps 3 and 5 in Section D.1 in the related new baseline methodology.</p>
27.	$\eta_{NG,IHD}$	Expert estimate based on site visit: Specific efficiency of individual heater using NG (IHD)	-	e	Once before project activity start	Sample	Electronic	See definition in Step 3 in Section D.1. in related NMB.
28.	$HEAT_{el}$	Expert estimate based on site visit: amount of heat produced by	MWh	m/e	Annually in period before	Sample	Electronic	Estimated based on electricity consumption pattern (summer vs. winter), random surveys in

Relevant data necessary for determining the baselining of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
		individual electric heaters (IHD) that compensate for insufficient DHS heating services ²			project activity start			consumer's apartments, sales data of individual electric heaters etc. See steps 3 and 5 in Section B.2.

²⁾ Only IHD that compensate insufficient DHS services are counted. Heat produced by electric IHDs that are not affected by the rehabilitation of the DHS (e.g. that are in rooms that will receive no heat services from the rehabilitated DHS) are not included.

Relevant data necessary for determining the baselining of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
29.	EF_{el}	Option (b): published study ³ on grid emission factors in Uzbekistan	tCO ₂ /MWh	c	At the beginning of each crediting period	Option (b): all power plants, including renewables, nuclear, etc.	electronic	See Step 4 in Section B.2.
30.	$COST_{HFO,y}$	Fuel supplier: cost of HFO; average market price in year y	USD/t	m	At the beginning of each crediting period	samples	electronic	Price as documented by official price list of supplier or other official statistics. All fuels used in DHS and IHD as well as electricity for heating have to be considered.
31.	$COST_{LFO,y}$	Fuel supplier: cost of LFO; average market price in year y	USD/t	m	At the beginning of each crediting period	samples	electronic	Price as documented by official price list of supplier or other official statistics. All fuels used in DHS and IHD as well as electricity for heating have to be considered.
32.	$COST_{NG,y}$	Fuel supplier: cost of NG; average market price in year y	USD/1000Nm ³	m	At the beginning of each crediting period	samples	electronic	Price as documented by official price list of supplier or other official statistics. All fuels used in DHS and IHD as well as electricity for heating have

³ Liliya Zavyalova and Axel Michaelowa, National CDM Criteria, Baseline Methodologies and Case Studies for Uzbekistan. HWWA Discussion Paper 126, Hamburg 2001;
http://www.hwwa.de/Projects/Res_Programmes/RP/Klimapolitik/HWWA_3062_FSP_Klima_Publikationen.htm

Relevant data necessary for determining the <u>baseline</u> of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :								
ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
								to be considered.
33.	$COST_{el,y}$	Fuel supplier: cost of electricity for heating; official price in year y	USD/MWh	m	At the beginning of each crediting period	samples	electronic	Price as documented by official price list of supplier or other official statistics. All fuels used in DHS and IHD as well as electricity for heating have to be considered.

Table 2: Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived

3 The Andijan Project MP Workbook

3.1 Introduction

This chapter explains and illustrates the steps required by the operator to enable the CO₂ emissions reductions to be calculated on a monthly and yearly basis using the electronic MP workbook, an Annex to the Andijan district heating project MP. This chapter therefore presents the worksheets contained in the workbook and illustrates their use. The section is intended as a user manual for the workbook; the assumption and principles used in the workbook have been explained in the preceding chapters.

The workbook enables the operator to calculate the total emissions reductions generated by:

- The avoided direct carbon dioxide emissions due to the displacement of NG/HFO fired district heating system by new efficient NG/LFO fired district heating system
- The effect on direct carbon dioxide emissions due to the displacement of NG fired individual heaters and boilers in apartments by new efficient NG/LFO fired district heating system
- The avoided indirect carbon dioxide emissions due to the displacement of individual electric heaters and boilers in apartments by new efficient NG/LFO fired district heating system
- The avoided indirect carbon dioxide emissions due to a reduction of the net electricity consumption by new efficient district heating system.

The operator has the responsibility to enter the required data feeds on a monthly and annual basis as required in the monitoring methodology (Chapter 2) and input data templates in the electronic workbook. The workbook should be saved after each update. Back up copies of the workbook should be saved and stored on a secure system on a monthly basis to avoid loss of information.

3.2 Summary of the workbook's content

The MP workbook for the Andijan district heating project contains three general worksheets and 12 worksheets for each of the sub-projects comprising the Andijan project:

Sheet	Title	Description
Sheet One	Instructions	Introduction and instructions for MP worksheet use
Sheet Two	MP summary	This sheet provides the annual summary of the total CO2 savings generated by the sum of the contributions from the different project activities.
Sheet three		diagramm
Sheet four	Factors and assumptions	Lists all assumptions and conversion factors as determined by the PDD and the Monitoring Plan and remaining stable for the duration of the project or until the baseline calculation would need to be adjusted..
Sheet Five- Sheet Fifteen	SP1- SP12	For each sub-project (SP) a seperate SP-sheet for data input and calculation is used. Here, both the monthly and the annual input of data by the operator (NEWCO) is necessary. Assumptions?

Table 3: Summary of the project workbook.

3.3 Emissions reductions calculations

The emission reduction calculations are described in the PDD Section and is implemented in the worksheets as self-calculating formulae to facilitate data recording and ERs calculation and reduce sources of mistakes.

3.4 Instructions on workbook use for operator

3.4.1 Conversion factors and assumptions (Sheet 3)

Sheet 3 (see Table 4 below) consists of a list of conversion factors and assumptions, to be determined prior to the project. Some values are fixed (determined by physics), some had been determined during the PDD development. They may not be changed by the NEWCO DHS operator after project validation, unless so instructed or agreed with the verifying DOE.

Conversion factors			
	Variable	Unit	Value
Carbon content	A	[tCO ₂ /tC]	3.667
Energy 1	B	[MJ/MWh]	3600
Energy 2	C	[J/Cal]	4.187

General assumptions and additional factors				
	Variable	Unit	Value	Data source
Specific heat of water	Cp_WATER	[MJ/m ³ K]	4.187	Physics Handbook

Assumptions baseline (ADHC)				
	Variable	Unit	Value	Data source
Specific baseline technology emission factor	EF_BLS	[tCO ₂ /GJ]	0.15873	PDD, Table 6
Ex-ante Electricity EF fossil Uzbekistan	EF_Fossil_ea	[gCO ₂ /kWh]	536.6	PDD, Table 6

Table 4: Sheet 3: Conversion factors and assumptions for baseline emissions

3.4.2 SP 1-12 Initial inputs (Sheets 4-15)

In order to prepare the sub-project sheets, the operator should enter or check the following data prior to the start of the concerned sub-project (SP):

Input	Units	Data source / point of measurement
Identifier of sub-project (SP)	[-]	Number of SP, between 1 and 12, see Section 1.4.
Number of nano-regions in sub-project	[-]	Per SP, 1 to 3 nano-regions are implemented.
Description of SP	[Text]	Here, the name of the nano-regions associated with the concerned SP and their location are described briefly.
Boilerhouses in SP	[Text]	Here, a short description of the boilerhouses in the SP with name and capacity is given.
Start date	[Date]	The first month of the sub-project operation is entered in the first line of the column "Month".

Table 5: Data to be entered at the begin of the SP into each SP-sheets

Also, the link from the SP-sheet to the MP summary sheet transferring the annual emission reductions in the SP should be checked and modified if necessary.

3.4.3 SP 1-12 Annual and monthly inputs (Sheets 4-15)

The SP-sheets consist of two types of inputs from the operator. Annual inputs into the pale yellow cells, monthly inputs into the deep yellow cells (see also workbook instructions). The tables below specifies the inputs required in more detail:

Compared to the new monitoring methodology which uses SI-units, the present workbook uses in some instances non-SI units in line with local practice (such as *GCal* instead of *GJ*), to simplify the work for operators and to omit errors from unit conversions during the completion of the workbook.

Monthly Inputs

Input	Units	Data source / point of measurement
Furnace oil (LFO) consumption	[t]	Recorded from fuel meters between fuel storage tank and boiler, and documented by fuel purchasing records. The monthly consumption of all boilers in the considered sub-project are summed. Fuel metered in liters should be converted to metric tonnes [t] using actual density data.
Natural gas consumption	[Nm ³]	Recorded from main natural gas meter at boiler house, and documented by fuel purchasing records. The monthly consumptions of all boilers in the considered sub-project are summed. NG metered in non-normal cubic meters should be converted to normal cubic meters [Nm ³] using actual NG pressure and temperature data.
Electricity consumption NEWCO	[MWh _e]	Recorded from main electricity meter at boiler houses and pumping stations and documented by electricity purchasing records. The monthly consumption of all boilerhouses and networks in the considered sub-project are summed.
Boiler heat output to network	[MWh]	As recorded by the heat meters at the boilerhouse, measuring the flow and the temperature difference between water entering and exiting the network. The monthly output of all boilerhouses in the considered sub-project are summed.
Apartments heat input	[MWh]	As recorded by the heat meters at the apartments, measuring the difference between water entering and exiting the apartments. The monthly input to all apartments in the considered sub-project are summed.
Apartments hot tap water input	[m ³]	As recorded by the hot water meters at the apartments. The monthly hot water input to all apartments in the considered sub-project are summed.
Date of data input	[Date]	
Name of person entering the data	[Name]	
Name of person checking the data	[Name]	

Table 6: *Data to be entered monthly into SP-sheets.*

Annual Inputs

Input	Units	Data source / point of measurement
Furnace oil net calorific value	[Gcal/t]	Data on furnace oil net calorific value is provided by the local supplier. If there is a change of supplier or origin of the fuel, the value should be modified within one month. If doubts arise on the accuracy of the data, NEWCO should arrange for the regular determination of the calorific value by a specialized laboratory.
Furnace oil carbon content	[tC/GJ]	Data on furnace oil carbon content might be available from the local supplier. If not, the value 0.0202tC/GJ (Source: IPCC Guidelines 1996 for LFO) should be used. If there is a change of supplier or origin of the fuel and new data available, the value should be modified within one month.
Furnace oil oxidation factor	[%]	If no local/supplier data is available, a conservative default value of 100.0% can be used.
Natural gas net calorific value	[Mcal/m ³]	Data on natural gas net calorific value is provided by the local supplier. If there is a change of supplier or origin of the fuel, the value should be modified within one month. If doubts arise on the accuracy of the data, NEWCO should arrange for the regular determination of the calorific value by a specialized laboratory.
Natural gas carbon content	[tC/GJ]	Data on natural gas carbon content might be available from the local supplier. If not, the value 0.01511tC/GJ ⁴⁾ should be used. If there is a change of supplier or origin of the fuel and new data available, the value should be modified within one month.
Natural gas oxidation factor	[%]	If no local/supplier data is available, a conservative default value of 100.0% can be used.
Mazud (HFO) carbon content	[tC/GJ]	Data on Mazud carbon content might be available from the local supplier of ADHC. If not, the value 0.0211tC/GJ (Source: IPCC Guidelines 1996 for HFO) should be used. If there is a change of supplier or origin of the fuel and new data available, the value should be modified within one month.
Total area heated by SP	[m ²]	Area of net heated space (living room and bedrooms, without corridors, bathroom, etc.) according to the norms of the Uzbek SNIP (Building Norms and Rules).

Table 7: *Data to be entered annually into SP-sheets.*

An Example for a completed SP-sheet is provided in Annex A1.

4) Source: GHG Emission Reduction, Manual for Project Setting, for Central Asia, Almaty, 2000.

Remarks:

Furnace oil will be regularly delivered by petrol tankers and be drained into storage tanks in every boiler house. Fuel feed into a boiler is carried out by a pump. Metering equipment will be installed between a fuel tank and a boiler for definition of furnace oil use.

Natural gas will be fed into the boilers from a local gas pipeline. The volume of used natural gas will be registered by gas metering. Metering has to take into account fluctuating pressure in the pipeline.

The *readings of metering equipment* (natural gas and furnace oil) are *daily* recorded into a special book by the operator on duty and *weekly* checked by the NEWCO manager. *Monthly*, the NEWCO accounts department will prepare a balance-sheet of delivered and used fuel. This balance-sheet will be archived in the accounts department. The monthly values will be entered into the SP-sheet.

Heat and hot water produced. The project foresees that heat and hot water metering equipment will be installed both on the production (boiler house) and the consumption level (apartments). For that, in every boiler house and service building metering equipment will be installed. The heat meters at the output of the boiler houses will be read and recorded *daily* and documented in a special book by the boiler house operator. The heat meters and hot water meters at every apartment in the buildings will be read and documented *monthly* by the NEWCO inspector.

3.5 Monitoring plan summary worksheet

Provided all steps are carried out as outlined in above for the SP-sheets, annual emissions reductions calculations will be displayed in the Section “Annual Emission Reduction Overview” in each of the SP-sheets. Also, each SP sheet calculates the monthly boiler-house, network and system efficiencies of the district heating system for information purposes and internal control.

A summary of emission reductions of the project is presented in an automated way in the MP Summary (Sheet 2; as shown below).

Factor:	Year	Year of Project	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Annual emission reduction	Cumulat. emission reductions
SP:			SP 1	SP 2	SP 3	SP 4	SP 5	SP 6	SP 7	SP 8	SP 9	SP 10	SP 11	SP 12	Total project	Total project cum.	
Symbol:	YEAR	Y															
Unit:	yr		[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	[tCO2]	
Remark:																	
	2006	1	10'804												10'804	10'804	
	2007	2	10'804	16'207											27'011	37'815	
	2008	3	10'804	16'207	16'207										43'217	81'033	
	2009	4	10'804	16'207	16'207										43'217	124'250	
	2010	5	10'804	16'207	16'207										43'217	167'468	
	2011	6	10'804	16'207	16'207										43'217	210'685	
	2012	7	10'804	16'207	16'207										43'217	253'903	
	2013	8	10'804	16'207	16'207										43'217	297'120	
	2014	9	10'804	16'207	16'207										43'217	340'337	
	2015	10	10'804	16'207	16'207	5'402									48'620	388'957	
	2016	11	10'804	16'207	16'207	5'402									48'620	437'577	
	2017	12	10'804	16'207	16'207	5'402	5'402								54'022	491'599	
	2018	13	10'804	16'207	16'207	5'402	5'402								54'022	545'620	
	2019	14	10'804	16'207	16'207	5'402	5'402	5'402							59'424	605'044	
	2020	15	10'804	16'207	16'207	5'402	5'402	5'402							59'424	664'468	
	2021	16	10'804	16'207	16'207	5'402	5'402	5'402	10'804						70'228	734'697	
	2022	17	10'804	16'207	16'207	5'402	5'402	5'402	10'804	5'402					75'631	810'327	
	2023	18	10'804	16'207	16'207	5'402	5'402	5'402	10'804	5'402	10'804				86'435	896'762	
	2024	19	10'804	16'207	16'207	5'402	5'402	5'402	10'804	5'402	10'804	5'402			91'837	988'599	
	2025	20	10'804	16'207	16'207	5'402	5'402	5'402	10'804	5'402	10'804	5'402	10'804		102'641	1'091'241	
	2026	21	10'804	16'207	16'207	5'402	5'402	5'402	10'804	5'402	10'804	5'402	10'804	10'804	113'446	1'204'687	
	Total C.P.		226'892	324'131	307'924	64'826	54'022	43'217	64'826	27'011	43'217	16'207	21'609	10'804			

Table 8: Annual emissions reductions summary (Sheet 2).

4 Management and Operational Systems MP

In order to ensure a successful operation of the Andijan district heating company and the credibility and verifiability of the CERs achieved, a well defined management and operational system needs to be installed. It is the obligation of the operator (NEWCO) to put such a system in place. It must include the operation and management of the monitoring and record keeping system that is described in this MP. The proper functioning of the management and operational system must be monitored by the operator and will be subject to third party verification as far as the ability of the project to generate credible CERs is concerned. Therefore, the project management responsibilities that concern this MP are outlined in this section.

4.1 Allocation of Project Management Responsibilities

The management and operation of the Andijan district heating company project is the responsibility of NEWCO, “the operator”. Ensuring the environmental credibility of the project through accurate and systematic monitoring of the project’s implementation and operation, for the purpose of achieving trustworthy CERs is the key responsibility of the operator as far as this MP is concerned. It is the operator who will be ultimately held to account for the quality of the CERs generated.

The project operator will have the responsibility to carry out all tests and analyses required under this MP, to procure and install all the necessary equipment and data acquisition systems to enable the collection and recording of the stipulated data at the required frequency, and to manage and present this data in the electronic workbook, possibly as part of a wider data management system that will be sufficient to meet the needs of this MP and the independent verifier.

Independent verifiers will audit the operator and their management systems to ensure credibility and transparency of the project’s reported CERs and other performance indicators.

For the time that the PCF has an interest in the project, the PCF shares the responsibility to ensure the credibility of the generated CERs. The PCF will arrange for periodic verification in line with the Kyoto Protocol requirements and modalities for CDM and

other relevant rules and will receive the verified and certified CERs and pay the operator as agreed under the terms of the ERPA.

4.2 Management and Operational Systems

It is the responsibility of the operator to develop and implement a management and operational system that meets the requirements of the project and of this MP. The MP can only offer general guidance in this regard and this is given below. The system proposed and implemented by the operator will be subject to assessment during initial and subsequent verification to ensure that it is of satisfactory quality to allow project performance in respect of CERs to be properly verified.

4.2.1 Monitoring System

The operator must appoint a competent manager who will be in charge of and accountable for the generation of CERs including monitoring, record keeping, computation of CERs, audits and verification. The operator will officially sign off on all official paper versions of GHG emission worksheets.

It is recommended that the activities outlined here be undertaken under an accredited quality assurance system, such as ISO (recommended) or a similar standard. This will ensure that all management and operational systems will meet the needs of external auditors.

Well-defined protocols and routine procedures, with good, professional data entry, extraction and reporting procedures will ease time and costs, while making it considerably easier for the auditor and verifier to track, monitor, verify and audit the project.

Proper management processes and systems records must be kept by the operator as the auditors will request copies of such records to judge compliance with the required management systems. Auditors will accept only one set of official information, and any discrepancies between the official, signed records and on-site records will be questioned.

4.2.2 Verification and Commissioning

The management and operational system and the capacity to implement this MP must be put in place before the project can start generating CERs. This will be verified before

the project is commissioned by the PCF to generate CERs that the PCF will accept under its ERPA. The verification process shall be done according to CDM M&P and using the Validation and Verification Manual⁵⁾.

4.2.3 Data Quality Assurance

The operator must establish transparent, auditable systems for the collection and storage of data, including adequate record keeping and data monitoring systems.

For electronic and paper based data entry and record keeping, there must be clarity in terms of the procedures and protocols for collection and entry of data, use of workbooks and spreadsheets and any assumptions made, so that compliance with requirements can be assessed by a third party. Stand-by processes and systems, e.g. paper based systems, must be outlined to provide for the possibility of electronic system failures and used in the event of such failure. The record keeping system must provide for a paper trail that can be audited.

Some monitoring activities may be based on appropriate sampling techniques. Particular reference is drawn to the issue of data uncertainty and scientific and systematic error in monitoring, the impact of uncertain data on reported emissions, and how this is managed. The monitoring system must also be able to cope with scheduled and unscheduled maintenance (operator system down time).

The project operator must establish procedures for development, approval and control of all documents related to project planning, implementation and operation to ensure that

- they can be located;
- they are periodically reviewed, revised as necessary and approved for adequacy by authorised personnel, i.e. the local project manager;
- current versions of relevant documents are available at all locations where operations essential to effective project operation are performed;
- obsolete documents are promptly removed from all points of issue and points of use, or otherwise assured against unintended use, i.e. by a “OUTDATED” stamp;
- any obsolete documents retained for legal and/or knowledge preservation purposes are suitably identified, and i.e. put in a separate binder.

Documentation shall be legible, dated (with dates of revision) and readily identifiable, maintained in an orderly manner and retained for the project period. It is also recommended that the project establish procedures for the identification, maintenance and disposition of records that substantiate the data given in the MP. In order to provide for

5) see <http://www.VVManual.info> .

independent verification, such records shall be maintained to demonstrate that the project comply to project requirements related to monitoring and calculation of emission reductions, and should, apart from the data necessary for calculating the emission reductions and the validity of the baseline as listed in Section 2.2, contain information on the quality of the processes, such as the following:

- Training records
- Incident reports
- Results of internal project reviews and evaluations
- Other results of monitoring, reporting and verification activities.

Such records must be legible, identifiable and traceable to the activity involved. They shall be recorded in a language agreed between project parties (Russian or English). The records must be stored and maintained in such a way that they are readily retrievable and protected against damage, deterioration or loss. It is recommended that they be retained at least two years longer than the project lifetime in a defined and secure place.

4.2.4 Performance Monitoring and Reporting

In order to meet the PCF's MP standards for data reporting, the operator will analyze his data and compare project performance with project targets. He will analyze system problems and recommend improvements. In addition to the internal monitoring process he will prepare reports for external audit and verification purposes as follows:

Copies of completed worksheets must be transmitted to the PCF by the operator on a regular basis (at least quarterly).

A brief annual or biannual report has to be prepared which should include: information on overall project performance, emission reductions generated and verified and comparison with targets, observations regarding MP baseline scenario indicators, compliance with sustainable development targets, information on adjustment of key MP assumptions by the project operator, concepts, calculation methods and other amendments of the MP and the monitoring system. The report as needed for a successful operation and monitoring, calculation of ERs and agreed to by the verifier, can be combined with the periodic verification report made by the verification company (operational entity).

4.2.5 MP Training and Capacity Building

It is the responsibility of the operator to ensure that the required capacity and internal training is made available to its operational staff to enable them to undertake the tasks required for operating as well as for the monitoring procedures required herewith.

Training and qualification needs for all operational personnel should be defined during the implementation period. All personnel that perform activities of importance for the project's correct performance and monitoring should be identified and trained accordingly. Such training and experience shall be provided before assignment to project operations. Records of qualification shall be kept for individuals. Such training shall include to address:

- performance that is of importance to GHG emissions and emission reductions,
- the environmental impact of each individual's performance and potential consequences of non-conforming operations
- roles and responsibilities in achieving project objectives and targets

The training shall include and refer to documented procedures for operational control.

In areas where it is deemed necessary, personnel qualifications shall be maintained during the project's lifetime. If new technology or methodology is introduced, appropriate training shall be provided and recorded.

Training is particularly important to ensure that operators use appropriate and consistent methods when they report data to be entered into MP worksheets, and when calibration or control of metering equipment is performed.

In the spirit of capacity building and project co-operation, the operator may want to include in training activities staff from government agencies involved in the project and possibly from other Uzbek entities involved in CDM projects.

4.2.6 Non-Conformance Event Handling

A non-conformance event will be a situation where the project does not comply with agreed performance criteria (regarding both content and form) or where other undesired situations occur. Procedures that cover this shall include definition of the responsibility and authority for handling and investigating project non-conformance. The project management should take appropriate action to mitigate any impacts caused by the non-conformance situation. The root cause of the non-conformance is to be investigated, and its identification should lead to the project management taking action to make sure that this will not reoccur. However, corrective action taken to eliminate causes of non-

conformances shall be appropriate to the magnitude of the problem. The project parties shall implement and record any changes in the project procedures resulting from such corrective actions.

4.2.7 Contingency Planning

The operator shall establish a procedure to identify potential for and responses to accidents and emergency situations as well as for preventing and mitigating environmental impacts that may be associated with them. Such procedures must ensure that personnel with necessary authority are available during project operation to take decisions in these situations. It is recommended that the project organization periodically test such procedures within a scope that is practicable, and suited to address identified risks.

If accidents or emergency situations occur, the project management should review and revise, where necessary, its emergency preparedness and response procedures.

4.2.8 Summary

The following table summarizes the roles and responsibilities of the various project partners with regard to the monitoring system.

	Project Operator (NEWCO)	Government of Uzbekistan⁶⁾	PCF
Implementation of monitoring system	<ul style="list-style-type: none"> Review MP and suggest adjustments if necessary Develop and establish management and operations system Establish and maintain monitoring system and implement MP 	Not applicable	<ul style="list-style-type: none"> Review monitoring and management system Ensure project meets PCF requirements and safeguards
Verification and commissioning	<ul style="list-style-type: none"> Prepare for initial verification and project commissioning 	Not applicable	<ul style="list-style-type: none"> Arrange for initial verification
Data Quality assurance: collection	<ul style="list-style-type: none"> Establish and maintain data measurement and collection systems for all MP indicators Check data quality and collection procedures regularly 	<ul style="list-style-type: none"> Receive and review reports Provide data to project operators as requested and agreed upon in the MP 	<ul style="list-style-type: none"> Review data collection systems
Data Quality assurance: computation	<ul style="list-style-type: none"> Enter data in MP workbooks Use MP workbooks to calculate emission reductions 	Not applicable	<ul style="list-style-type: none"> Review completed worksheets
Data Quality assurance: storage	<ul style="list-style-type: none"> Implement record maintenance system Store and maintain records 	Not applicable	<ul style="list-style-type: none"> Receive copies of key records and reports Maintain PCF records

6) Subject to CDM policy of and agreements with Government of Uzbekistan.

	Project Operator (NEWCO)	Government of Uzbekistan⁶⁾	PCF
	<p>(paper trail)</p> <ul style="list-style-type: none"> • Implement sign off system for completed worksheets • Forward monthly and annual worksheet outputs 		
Performance monitoring and reporting	<ul style="list-style-type: none"> • Analyse data and compare project performance with project targets • Analyse system problems and recommend and implement improvements (performance management) • Prepare and forward periodic reports 	Receive and review reports	<ul style="list-style-type: none"> • Review reports
Quality assurance, audit and verification	<ul style="list-style-type: none"> • Establish and maintain quality assurance system with a view to ensuring transparency and allowing for audits and verification • Prepare for, facilitate and co-ordinate audits and verification process 	Not applicable	<ul style="list-style-type: none"> • Arrange for periodic verification
MP Training and Capacity Building	<ul style="list-style-type: none"> • Develop and establish MP training, skills review and feedback system • Ensure operational staff trained and enabled to meet needs of MP • Consider providing training support to national authorities and other parties interested 	Not applicable	<ul style="list-style-type: none"> • Assist with MP training and capacity building as may be appropriate in PCF's judgement
Non-Conformance Event Handling	<ul style="list-style-type: none"> • Establish non-conformance event handling plan • In case of non-conformance events take appropriate action to investigate on root cause and to mitigate any impacts • Report on Non-conformance events to GoU, PCF and EBRD 	Not applicable	<ul style="list-style-type: none"> • Review non-conformance event handling plan • In case of significant non-conformance, arrange for investigation on root cause as well as assistance with the preventing of impacts caused by the non-conformance situation
Contingency Planning	<ul style="list-style-type: none"> • Establish contingency plan • In case of emergency take appropriate action to mitigate impacts and investigate on root cause 	Not applicable	

Table 9: *MP management and operation system: roles of project partners.*

References

- [1] EBP, *Swiss Thermal Energy Project in Buzau and Pascani, Romania. Part B: Proposal for Joint Implementation of STEP*. Prepared by Ernst Basler + Partners (EBP) for Swiss State Secretariat for Economic Affairs, Zürich 1998.

- [2] ESD, *Bulgaria: Wood Industries, Svilosa Biomass Boiler Project. Monitoring Plan (MP)*. Prepared by Energy for Sustainable Development Ltd (ESD), UK for the Prototype Carbon Fund, October 2002.

A1 Example for SP-Sheet (Monitoring sheet for one sub-project)

The following two pages provide excerpts of an example SP-sheet from the MP-Workbook for the first sub-project of the Andijan project, consisting of 2 nano-regions (approx. 140'000 m² of heated space). Only the first two years are shown, entries for project activity fuel consumption etc. are estimated values.

The spread-sheet-based workbook for ERs is an integral part of this MP.

The Andijan Project Workbook

SHEET Sub-Project (SP) - Inputs and emissions

This sheet lists all the parameters which need to be entered by the operator and provides emission calculations for one project activity.

Identifier of SP: 1
of nano-regions in this S 2
Description of SP: Nano-regions xyz in xyz district and abc in aaa district of Andijan City
Boilerhouses in this SP: Boilerhouse xx, Boilerhouse yy

Input factors for emission calculation															Control	
Factor:	Month	Year of SP	Furnace oil consumption	Natural gas consumption	Electricity consumption NEWCO	Furnace oil net calorific value	Furnace oil carbon content	Natural gas net calorific value	Natural gas carbon content	Boiler heat output to network	Apartment's heat input	Apartment's hot tap water input	Apartment's energy input	Total area heated by SP	Electricity EF average Uzbekistan	Apartment's heat and hot water energy input
Symbol:	MONTH	Y	LFO	NG	MWh_NEWCO	NCV_LFO	CC_LFO	NCV_NG	CC_NG	MWh_Boiler (info only)	MWh_Heat	WATER	MWh_Water	AREA	EF_GRID	
Unit:		yr	[t]	[Nm³]	[MWh]	[Gcal/t]	[tC/GJ]	[Mcal/Nm³]	[tC/GJ]	[MWh]	[MWh]	[M³]	[MWh]	[m²]	[gCO2/kWh]	[GJ]
	Jan 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Feb 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Mrz 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Apr 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Mai 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Jun 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Jul 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Aug 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Sep 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Oct 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Nov 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Dez 06	1	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Jan 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Feb 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Mrz 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Apr 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Mai 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Jun 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Jul 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Aug 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Sep 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Oct 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Nov 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355
	Dez 07	2	192.030	236.283	23.33	10.15	0.0202	8.249	0.0151	3690	3'431.9	0	0	140'000	536.6	12'355

[illegible]

Table 10: Example of SP-sheet for the first sub-project of the Andijan project