

Monitoring Report Sheet (Input Sheet) [For Verification]

Table 1: Parameters monitored ex post

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)
Monitoring period	Monitoring point No.	Parameters	Description of data	Monitored Values	Units	Monitoring option	Source of data	Measurement methods and procedures	Monitoring frequency	Other comments
2016/10/06-2016/12/31	1	$EC_{PJ,i,outdoor,p}$	Electricity consumption of outdoor unit of project air conditioning system i during the period p	-	MWh/p	Option C	Monitored data	<ul style="list-style-type: none"> - Measuring equipment is installed in each outdoor unit of air conditioning system to measure power consumption. - Measured data is automatically transmitted to the server for recording. - data recorded in the server is reported and double-checked by a responsible staff on a monthly basis to prevent missing data. - in case a calibration certificate issued by an entity accredited under national/international standards is not provided, such Measuring equipment is required to be calibrated. 	Continuously	Monitored values are input on "MRS(input _each system)" sheet
2016/10/06-2016/12/31	2	$EC_{PJ,i,indoor,p}$	Total electricity consumption of indoor units of project air conditioning system during the period p	24.74	MWh/p	Option C	Monitored data	<p>Monitoring is conducted with any of the following methods:</p> <p>[Method 1: Measuring equipment]</p> <ul style="list-style-type: none"> - Measuring equipment is installed to measure power consumption by air conditioning system. - Measured data is automatically transmitted to the server for recording. - Data recorded in the server is reported and double-checked by a responsible staff on a monthly basis to prevent missing data. - In case a calibration certificate issued by an entity accredited under national/international standards is not provided, such measuring equipment is required to be calibrated. <p>[Method 2: Estimation based on operating hours of indoor unit]</p> <ul style="list-style-type: none"> - Power consumption of indoor units is estimated from rated power consumption and operating hours of indoor unit with the following equation: $EC_{PJ,i,indoor,p} = RPC_{PJ,i,indoor} \times H_{PJ,i,indoor,p}$ $RPC_{PJ,i,indoor}$: Rated power consumption of indoor unit i $H_{PJ,i,indoor,p}$: Operating hours of indoor unit i - Measuring equipment is installed in each indoor unit to monitor operating hours. - Measured data is automatically transmitted to the server for recording. - Data recorded in the server is reported and double-checked by a responsible staff on a monthly basis to prevent missing data. 	Continuously	n/a

						<p>[Method 3: Estimation based on operating hours of outdoor unit]</p> <ul style="list-style-type: none"> - Power consumption of indoor units is estimated from rated power consumption of indoor unit and operating hours of connected outdoor unit with the following equation: $EC_{P,J,i,indoor,p} = RPC_{P,J,i,indoor} \times H_{P,J,i,outdoor,p}$ $RPC_{P,J,i,indoor}$: Total rated power consumption of indoor unit connected outdoor unit i $H_{P,J,i,outdoor,p}$: Operating hours of outdoor unit i - Measuring equipment is installed in each outdoor unit to monitor operating hours. - Measured data is automatically transmitted to the server for recording. - Data recorded in the server is reported and double-checked by a responsible staff on a monthly basis to prevent missing data. 		
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Table 2: Project-specific parameters fixed *ex ante*

(a)	(b)	(c)	(d)	(e)	(f)
Parameters	Description of data	Estimated Values	Units	Source of data	Other comments
EF_{elec}	<p>CO₂ emission factor for consumed electricity.</p> <p>When captive power generation is not available at the project site, then the most recent Vietnamese national grid emission factor [EF_{grid}] available at the time of validation is applied as [EF_{elec}] and fixed for the monitoring period thereafter.</p> <p>When captive power generation is available at the project site, then [EF_{elec}] is conservatively selected as below and fixed for the monitoring period thereafter:</p> <p>$EF_{elec} = \min(EF_{grid}, EF_{captive})$ $EF_{captive} = 0.8 \text{ tCO}_2/\text{MWh}^*$</p> <p>*The most recent emission factor available from CDM approved small scale methodology AMS-I.A at the time of validation is applied.</p>	0.566	tCO ₂ /MWh	<p>[EF_{grid}] Ministry of Natural Resources and Environment of Vietnam (MONRE), Vietnamese DNA for CDM unless otherwise instructed by the Joint Committee.</p> <p>[$EF_{captive}$] CDM approved small scale methodology: AMS-I.A</p>	n/a
$COP_{P,J,i,outdoor}$	COP of outdoor unit of project air conditioning system i (Outdoor unit)	-	-	Specifications of project air conditioning system for the quotation or factory acceptance test data by manufacturer.	Values are input on "MPS(input_each system)" sheet

$COP_{RE,i}$	COP of reference air conditioning system i (Outdoor Unit + Indoor Unit)	-	-	Nominal value available on product catalogs, specification documents or websites, hearing survey. The default values are derived from the result of survey on COP of air conditioning system with non-inverter from manufacturers that have high market share. The default values should be revised if necessary from survey result which is conducted by JC or project participants every three years. The survey should prove the use of clear methodology.	Values are input on "MPS(input_each system)" sheet
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Table3: Ex-post calculation of CO₂ emission reductions

Monitoring Period	CO ₂ emission reductions	Units
2016/10/06-2016/12/31	35	tCO ₂ /p

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

		Parameters monitored <i>ex post</i>	Project-specific parameters fixed <i>ex ante</i>			Ex-post calculation of emissions	
Parameters	<i>i</i>	$EC_{PJ,i,outdoor,p}$	$COP_{PJ,i,outdoor}$	$COP_{RE,i}$	EF_{elec}	$RE_{i,p}$	$PE_{i,outdoor,p}$
Description of data	Identification number of air conditioning system	Electricity consumption of outdoor unit of project air conditioning system <i>i</i> during the period <i>p</i>	COP of outdoor unit of project air conditioning system <i>i</i>	COP of reference air conditioning system <i>i</i>	CO ₂ emission factor for consumed electricity	Reference emissions by air conditioning system <i>i</i> during the period <i>p</i>	Project emissions by outdoor unit air conditioning system <i>i</i> during the period <i>p</i>
Units	-	MWh/p	-		tCO ₂ /MWh	tCO ₂ /p	tCO ₂ /p
Monitored values	1	12.18	4.53	2.56	0.566	12.2	6.9
	2	13.55	4.05	2.56	0.566	12.1	7.7
	3	12.09	4.05	2.56	0.566	10.8	6.8
	4	6.62	3.29	2.56	0.566	4.8	3.7
	5	7.19	4.09	2.56	0.566	6.5	4.1
	6	8.71	4.09	2.56	0.566	7.9	4.9
	7	7.02	4.09	2.56	0.566	6.3	4.0
	8	7.47	4.09	2.56	0.566	6.8	4.2
	9	8.17	4.09	2.56	0.566	7.4	4.6
	10	7.00	4.09	2.56	0.566	6.3	4.0
	11	7.10	4.09	2.56	0.566	6.4	4.0
	12	7.31	4.09	2.56	0.566	6.6	4.1
	13	6.40	4.09	2.56	0.566	5.8	3.6
	14	8.37	4.09	2.56	0.566	7.6	4.7
	15	6.66	4.09	2.56	0.566	6.0	3.8
	16	16.31	4.09	2.56	0.566	14.7	9.2
	17	7.94	3.27	2.56	0.566	5.7	4.5
	18		0.00	0.00	0.566	0.0	0.0
	19		0.00	0.00	0.566	0.0	0.0
	20		0.00	0.00	0.566	0.0	0.0
	21		0.00	0.00	0.566	0.0	0.0
	22		0.00	0.00	0.566	0.0	0.0
	23		0.00	0.00	0.566	0.0	0.0
	24		0.00	0.00	0.566	0.0	0.0
	25		0.00	0.00	0.566	0.0	0.0
	26		0.00	0.00	0.566	0.0	0.0
	27		0.00	0.00	0.566	0.0	0.0
	28		0.00	0.00	0.566	0.0	0.0
	29		0.00	0.00	0.566	0.0	0.0
	30		0.00	0.00	0.566	0.0	0.0
	31		0.00	0.00	0.566	0.0	0.0
	32		0.00	0.00	0.566	0.0	0.0
	33		0.00	0.00	0.566	0.0	0.0
	34		0.00	0.00	0.566	0.0	0.0
	35		0.00	0.00	0.566	0.0	0.0
	36		0.00	0.00	0.566	0.0	0.0
	37		0.00	0.00	0.566	0.0	0.0
	38		0.00	0.00	0.566	0.0	0.0
	39		0.00	0.00	0.566	0.0	0.0
	40		0.00	0.00	0.566	0.0	0.0
	41		0.00	0.00	0.566	0.0	0.0
	42		0.00	0.00	0.566	0.0	0.0
	43		0.00	0.00	0.566	0.0	0.0
	44		0.00	0.00	0.566	0.0	0.0
	45		0.00	0.00	0.566	0.0	0.0
	46		0.00	0.00	0.566	0.0	0.0
	47		0.00	0.00	0.566	0.0	0.0
	48		0.00	0.00	0.566	0.0	0.0
	49		0.00	0.00	0.566	0.0	0.0
	50		0.00	0.00	0.566	0.0	0.0
	Total	-	-	-	-	134.0	84.9

Monitoring Report Sheet (Calculation Process Sheet) [For Verification]

1. Calculations for emission reductions	Fuel type	Value	Units	Parameter
Emission reductions during the period p	N/A	35.1	tCO ₂ /p	ER _p
2. Selected default values, etc.				
CO ₂ emission factor for consumed electricity.	Electricity	0.566	-	EF _{elec}
COP of reference air conditioning system i (Outdoor Unit + Indoor Unit)	-	-	-	COP _{RE,i}
3. Calculations for reference emissions				
Reference emissions during the period p	N/A	134.0	tCO ₂ /p	RE _p
*Calculation for each air conditioning system is detailed in "MRS(input_each system)" sheet				
4. Calculations of the project emissions				
Project emissions during the period p	N/A	98.9	tCO ₂ /p	PE _p
Project emissions by outdoor unit	Electricity	84.9	tCO ₂ /p	PE _{outdoor,p}
Project emissions by indoor unit	Electricity	14.0	tCO ₂ /p	PE _{indoor,p}
Total electricity consumption of indoor units of project air conditioning system during the period p	Electricity	24.74	MWh/p	EC _{PJ,indoor,p}
CO ₂ emission factor for consumed electricity	Electricity	0.566	tCO ₂ /MWh	EF _{elec}

[List of Default Values]

Project-specific parameters to be fixed <i>ex ante</i>	
COP of reference air conditioning system (Outdoor Unit + Indoor Unit) (Cooling capacity $14.0 \leq x < 28.0\text{kW}$)	2.97
COP of reference air conditioning system (Outdoor Unit + Indoor Unit) (Cooling capacity $28.0 \leq x < 42.0\text{kW}$)	2.94
COP of reference air conditioning system (Outdoor Unit + Indoor Unit) (Cooling capacity $42.0 \leq x < 56.0\text{kW}$)	2.91
COP of reference air conditioning system (Outdoor Unit + Indoor Unit) (Cooling capacity $56.0 \leq x$)	2.56

Monitoring Report Sheet (Input Sheet) [For Verification]

Table 1: Parameters monitored ex post

(a) Monitoring period	(b) Monitoring point No.	(c) Parameters	(d) Description of data	(e) Monitored Values	(f) Units	(g) Monitoring option	(h) Source of data	(i) Measurement methods and procedures	(j) Monitoring frequency	(k) Other comments
2017/01/01-2017/09/30	1	$EC_{PJ,i,outdoor,p}$	Electricity consumption of outdoor unit of project air conditioning system i during the period p	-	MWh/p	Option C	Monitored data	<ul style="list-style-type: none"> - Measuring equipment is installed in each outdoor unit of air conditioning system to measure power consumption. - Measured data is automatically transmitted to the server for recording. - data recorded in the server is reported and double-checked by a responsible staff on a monthly basis to prevent missing data. - in case a calibration certificate issued by an entity accredited under national/international standards is not provided, such Measuring equipment is required to be calibrated. 	Continuously	Monitored values are input on "MRS(input _each system)" sheet
2017/01/01-2017/09/30	2	$EC_{PJ,i,indoor,p}$	Total electricity consumption of indoor units of project air conditioning system during the period p	81	MWh/p	Option C	Monitored data	<p>Monitoring is conducted with any of the following methods:</p> <p>[Method 1: Measuring equipment]</p> <ul style="list-style-type: none"> - Measuring equipment is installed to measure power consumption by air conditioning system. - Measured data is automatically transmitted to the server for recording. - Data recorded in the server is reported and double-checked by a responsible staff on a monthly basis to prevent missing data. - In case a calibration certificate issued by an entity accredited under national/international standards is not provided, such measuring equipment is required to be calibrated. <p>[Method 2: Estimation based on operating hours of indoor unit]</p> <ul style="list-style-type: none"> - Power consumption of indoor units is estimated from rated power consumption and operating hours of indoor unit with the following equation: $EC_{PJ,i,indoor,p} = RPC_{PJ,i,indoor} \times H_{PJ,i,indoor,p}$ $RPC_{PJ,i,indoor}$: Rated power consumption of indoor unit i $H_{PJ,i,indoor,p}$: Operating hours of indoor unit i - Measuring equipment is installed in each indoor unit to monitor operating hours. - Measured data is automatically transmitted to the server for recording. - Data recorded in the server is reported and double-checked by a responsible staff on a monthly basis to prevent missing data. 	Continuously	n/a

						<p>[Method 3: Estimation based on operating hours of outdoor unit]</p> <ul style="list-style-type: none"> - Power consumption of indoor units is estimated from rated power consumption of indoor unit and operating hours of connected outdoor unit with the following equation: $EC_{PJ,i,indoor,p} = RPC_{PJ,i,indoor} \times H_{PJ,i,outdoor,p}$ $RPC_{PJ,i,indoor}$: Total rated power consumption of indoor unit connected outdoor unit i $H_{PJ,i,outdoor,p}$: Operating hours of outdoor unit i - Measuring equipment is installed in each outdoor unit to monitor operating hours. - Measured data is automatically transmitted to the server for recording. - Data recorded in the server is reported and double-checked by a responsible staff on a monthly basis to prevent missing data. 		
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Table 2: Project-specific parameters fixed *ex ante*

(a)	(b)	(c)	(d)	(e)	(f)
Parameters	Description of data	Estimated Values	Units	Source of data	Other comments
EF_{elec}	<p>CO₂ emission factor for consumed electricity.</p> <p>When captive power generation is not available at the project site, then the most recent Vietnamese national grid emission factor [EF_{grid}] available at the time of validation is applied as [EF_{elec}] and fixed for the monitoring period thereafter.</p> <p>When captive power generation is available at the project site, then [EF_{elec}] is conservatively selected as below and fixed for the monitoring period thereafter:</p> <p>$EF_{elec} = \min(EF_{grid}, EF_{captive})$ $EF_{captive} = 0.8 \text{ tCO}_2/\text{MWh}^*$</p> <p>*The most recent emission factor available from CDM approved small scale methodology AMS-I.A at the time of validation is applied.</p>	0.566	tCO ₂ /MWh	<p>[EF_{grid}] Ministry of Natural Resources and Environment of Vietnam (MONRE), Vietnamese DNA for CDM unless otherwise instructed by the Joint Committee.</p> <p>[$EF_{captive}$] CDM approved small scale methodology: AMS-I.A</p>	n/a
$COP_{PJ,i,outdoor}$	COP of outdoor unit of project air conditioning system i (Outdoor unit)	-	-	Specifications of project air conditioning system for the quotation or factory acceptance test data by manufacturer.	Values are input on "MPS(input_each system)" sheet

COP _{RE,i}	COP of reference air conditioning system <i>i</i> (Outdoor Unit + Indoor Unit)	-	-	Nominal value available on product catalogs, specification documents or websites, hearing survey. The default values are derived from the result of survey on COP of air conditioning system with non-inverter from manufacturers that have high market share. The default values should be revised if necessary from survey result which is conducted by JC or project participants every three years. The survey should prove the use of clear methodology.	Values are input on "MPS(input_each system)" sheet
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Table3: Ex-post calculation of CO₂ emission reductions

Monitoring Period	CO ₂ emission reductions	Units
2017/01/01-2017/09/30	154	tCO ₂ /p

[Monitoring option]

Option A	Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
Option B	Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
Option C	Based on the actual measurement using measuring equipments (Data used: measured values)

		Parameters monitored <i>ex post</i>	Project-specific parameters fixed <i>ex ante</i>			Ex-post calculation of emissions	
Parameters	<i>i</i>	$EC_{PJ,i,outdoor,p}$	$COP_{PJ,i,outdoor}$	$COP_{RE,i}$	EF_{elec}	$RE_{i,p}$	$PE_{i,outdoor,p}$
Description of data	Identification number of air conditioning system	Electricity consumption of outdoor unit of project air conditioning system <i>i</i> during the period <i>p</i>	COP of outdoor unit of project air conditioning system <i>i</i>	COP of reference air conditioning system <i>i</i>	CO ₂ emission factor for consumed electricity	Reference emissions by air conditioning system <i>i</i> during the period <i>p</i>	Project emissions by outdoor unit air conditioning system <i>i</i> during the period <i>p</i>
Units	-	MWh/p	-		tCO ₂ /MWh	tCO ₂ /p	tCO ₂ /p
Monitored values	1	70.71	4.53	2.56	0.566	70.8	40.0
	2	53.89	4.05	2.56	0.566	48.2	30.5
	3	51.88	4.05	2.56	0.566	46.4	29.3
	4	24.15	3.29	2.56	0.566	17.6	13.7
	5	27.84	4.09	2.56	0.566	25.2	15.8
	6	34.17	4.09	2.56	0.566	30.9	19.3
	7	23.66	4.09	2.56	0.566	21.4	13.4
	8	27.08	4.09	2.56	0.566	24.5	15.3
	9	28.40	4.09	2.56	0.566	25.7	16.1
	10	23.25	4.09	2.56	0.566	21.0	13.2
	11	24.26	4.09	2.56	0.566	21.9	13.7
	12	26.41	4.09	2.56	0.566	23.9	14.9
	13	23.73	4.09	2.56	0.566	21.4	13.4
	14	31.06	4.09	2.56	0.566	28.1	17.6
	15	27.36	4.09	2.56	0.566	24.7	15.5
	16	74.64	4.09	2.56	0.566	67.5	42.2
	17	29.52	3.27	2.56	0.566	21.3	16.7
	18		0.00	0.00	0.566	0.0	0.0
	19		0.00	0.00	0.566	0.0	0.0
	20		0.00	0.00	0.566	0.0	0.0
	21		0.00	0.00	0.566	0.0	0.0
	22		0.00	0.00	0.566	0.0	0.0
	23		0.00	0.00	0.566	0.0	0.0
	24		0.00	0.00	0.566	0.0	0.0
	25		0.00	0.00	0.566	0.0	0.0
	26		0.00	0.00	0.566	0.0	0.0
	27		0.00	0.00	0.566	0.0	0.0
	28		0.00	0.00	0.566	0.0	0.0
	29		0.00	0.00	0.566	0.0	0.0
	30		0.00	0.00	0.566	0.0	0.0
	31		0.00	0.00	0.566	0.0	0.0
	32		0.00	0.00	0.566	0.0	0.0
	33		0.00	0.00	0.566	0.0	0.0
	34		0.00	0.00	0.566	0.0	0.0
	35		0.00	0.00	0.566	0.0	0.0
	36		0.00	0.00	0.566	0.0	0.0
	37		0.00	0.00	0.566	0.0	0.0
	38		0.00	0.00	0.566	0.0	0.0
	39		0.00	0.00	0.566	0.0	0.0
	40		0.00	0.00	0.566	0.0	0.0
	41		0.00	0.00	0.566	0.0	0.0
	42		0.00	0.00	0.566	0.0	0.0
	43		0.00	0.00	0.566	0.0	0.0
	44		0.00	0.00	0.566	0.0	0.0
	45		0.00	0.00	0.566	0.0	0.0
	46		0.00	0.00	0.566	0.0	0.0
	47		0.00	0.00	0.566	0.0	0.0
	48		0.00	0.00	0.566	0.0	0.0
	49		0.00	0.00	0.566	0.0	0.0
	50		0.00	0.00	0.566	0.0	0.0
	Total	-	-	-	-	540.4	340.6

Monitoring Report Sheet (Calculation Process Sheet) [For Verification]

1. Calculations for emission reductions		Fuel type	Value	Units	Parameter
Emission reductions during the period p		N/A	154.2	tCO ₂ /p	ER _p
2. Selected default values, etc.					
CO ₂ emission factor for consumed electricity.		Electricity	0.566	-	EF _{elec}
COP of reference air conditioning system i (Outdoor Unit + Indoor Unit)		-	-	-	COP _{RE,i}
3. Calculations for reference emissions					
Reference emissions during the period p		N/A	540.4	tCO ₂ /p	RE _p
*Calculation for each air conditioning system is detailed in "MRS(input_each system)" sheet					
4. Calculations of the project emissions					
Project emissions during the period p		N/A	386.2	tCO ₂ /p	PE _p
Project emissions by outdoor unit		Electricity	340.6	tCO ₂ /p	PE _{outdoor,p}
Project emissions by indoor unit		Electricity	45.6	tCO ₂ /p	PE _{indoor,p}
Total electricity consumption of indoor units of project air conditioning system during the period p		Electricity	80.69	MWh/p	EC _{PJ,indoor,p}
CO ₂ emission factor for consumed electricity		Electricity	0.566	tCO ₂ /MWh	EF _{elec}

[List of Default Values]

Project-specific parameters to be fixed <i>ex ante</i>	
COP of reference air conditioning system (Outdoor Unit + Indoor Unit) (Cooling capacity $14.0 \leq x < 28.0$ kW)	2.97
COP of reference air conditioning system (Outdoor Unit + Indoor Unit) (Cooling capacity $28.0 \leq x < 42.0$ kW)	2.94
COP of reference air conditioning system (Outdoor Unit + Indoor Unit) (Cooling capacity $42.0 \leq x < 56.0$ kW)	2.91
COP of reference air conditioning system (Outdoor Unit + Indoor Unit) (Cooling capacity $56.0 \leq x$)	2.56