CLEAN DEVELOPMENT MECHANISM

CDM-EB88-AA-A10

Draft Small-scale Methodology

AMS-I.X: Solar power for aircraft at-gate operations

Sectoral scope(s): 01, 07

United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. In 2014 the secretariat received a request from International Civil Aviation Organization (ICAO), to jointly develop two aviation methodologies under the CDM.

2. The Executive Board of the clean development mechanism (CDM) (the Board) at its eighty-first meeting (EB81) agreed under the 2015 CDM management plan (MAP 2015) to include the “Top down development of Methodologies/Standardized baselines and tools” covering, among others, aviation sector.[1]

3. The secretariat in close collaboration with experts from the ICAO and in consultation with the Small Scale Working Group (SSC WG) developed draft methodology covering application of solar PV for at-gate operations involving aircrafts that operate on domestic routes.

4. Following the consultation with the Methodologies Panel (MP) at its sixty-seventh meeting, the SSC WG at its 48th meeting agreed to launch a call for public input on the draft methodology “AMS-I.x: Solar power for domestic aircraft at-gate operations”.

5. The Board at its eighty-seventh meeting (EB 87), considered the proposed new top-down small-scale methodology “AMS -I.XXX: Solar power for domestic aircraft at-gate operations” for the aviation sector developed in consultation with the ICAO and agreed not to accept the methodology as proposed by the SSC WG at its 49th meeting. The Board requested the secretariat to prepare a revised draft expanding the scope of the methodology to include:

    (a) Emission reductions from airport ground operations servicing both international and domestic flights; and

    (b) Displacement of ground power unit or grid electricity.

6. The Board also requested the secretariat to seek inputs from ICAO on the draft methodology, and recommend it for the approval of the Board at its next meeting (EB 88).

[1] See EB82 Annex 11 (Paragraph 18-22), Concept note: Development of new methodologies to broaden the applicability of CDM” available at <http://cdm.unfccc.int/Meetings/MeetingInfo/DB/C1REFM4G0ZT6K8P/view and Annex 2, EB82 (Page 32) "Work-plan of panels and working groups for 2015 (version 01.0) available at http://cdm.unfccc.int/EB/index.html>.

2. Purpose

7. To develop a new methodology based on the objective of CDM MAP 2015 to improve the existing regulation by broadening the coverage of CDM in aviation sector.

3. Key issues and proposed solutions

8. Emissions from aviation activities represent approximately 2 per cent of global anthropogenic CO_2 emissions. The magnitude of forecasted traffic growth, however, suggests that the future contribution of aviation activities to climate change will be significantly higher in the coming decades.

9. Emissions from international aviation activities (i.e. flights between countries) are being addressed by the ICAO, which has established an aspirational goal of carbon-neutral growth beyond 2020 and is pursuing a basket of measures such as aircraft-related technology development, alternative fuels, improved air traffic management and infrastructure, efficient operations, and market-based measures.

10. At-gate aircraft require power to operate its electrical systems as well as the internal heating, ventilation, and air conditioning systems. Current practice involves the generation of power from carbon intensive on-board auxiliary power units (APUs) and/or ground power units (GPUs) supplied by grid electricity of fossil fuel based energy generation system. The proposed methodology aims for displacement of carbon intensive electricity with renewable electricity.

11. The secretariat revised the methodology to include international aircrafts and consulted with ICAO for their feedback. The ICAO did not support the approval of the revised draft expanding the scope of the methodology to cover international aircrafts and requested the methodology be withdrawn from further consideration. On this basis, the secretariat presents the possible three options for the Board to decide:

    (a) Option 1 – Project activity covering only the domestic aircrafts as proposed by the SSC-WG;

    (b) Option 2 – Project activity covering both domestic and international aircrafts;

    (c) Option3 - Withdraw the methodology as requested by ICAO.

4. Impacts

12. The proposed methodology would expand its portfolio of methodologies expansion into a fast-growing sector that remains largely untapped by crediting mechanisms.

5. Subsequent work and timelines

13. The methodology is recommended by the secretariat for consideration by the Board at its eighty-eighth meeting. No further work is envisaged.

6. Recommendations to the Board

14. The secretariat recommends that the Board adopt one of the provided options in paragraph 11.

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Appendix 1. Option 1 – Project activity covering only the domestic aircrafts

1. Introduction

1. The following table describes the key elements of the methodology.

Table 1. Methodology key elements

Typical project(s)	Production of electricity using solar photovoltaic technology that supply electrical energy for aircraft at-gate operations in airports
Type of GHG emissions mitigation action	Renewable energy. Displacement of energy that would be provided to the airports for at-gate operation by GHG-intensive means (grid, fossil fuel)

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology comprises renewable energy generation from solar photovoltaic technology that supply electrical energy to airports for aircraft at-gate operations. Methodology is only applicable to domestic flights and flights that operate on international routes are not included in this methodology.

3. The project activity shall displace energy demand for electricity and pre-conditioned air from both external and internal generation that is or would have been supplied by at least one fossil fuel generating unit, i.e. in the absence of the project activity the users would have been supplied electricity from one of the sources listed below:

(a) Auxiliary Power Unit (APU);

(b) Ground Power Unit (GPU);

(c) A national or a regional grid (grid hereafter); and/or

(d) Fossil fuel fired captive power plant(s).[2]

2.2. Applicability

4. The methodology is applicable to project activities that:

(a) Install a new solar photovoltaic system (Greenfield plant) at an airport facility where no onsite renewable energy power generation capacities exists prior to implementation of the project activity that supplies power to the airport's at-gate operations;

[2] Where the users of the captive electricity may also be connected to the grid in the project site.

(b) Supply electricity and/or pre-conditioned air to the airplane at gate through use of solar power that partially or fully replaces those of external power sources connected to the airplane or internal power sources, i.e. with only engine generator (APU) running;

(c) Supply electricity to an airport electricity distribution system (AEDS), as and where applicable, that services at-gate operations. This AEDS supplied by the project is not connected to grid and/or captive generation.

5. If the unit added has both renewable and non-renewable components (e.g. solar and diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component.

6. The methodology is only applicable to claim emission reductions for supply and displacement of electrical energy and pre-conditioned air for at-gate operations, i.e. the point of use, where these services are utilized by the aircraft.

7. The methodology is not applicable where the output of the project activity is supplied to the grid. For projects of grid connected renewable electricity supply, project proponents may choose to apply the latest version of the approved methodology of “AMS-I.D: Grid connected renewable electricity generation”.

8. The methodology is not applicable to abnormal[3] and/or emergency at-gate operations.

9. Project participant should ensure through a contractual agreement with the end-user(s) of solar electricity that the end-user(s) do not claim emission reductions from using it through a separate CDM project activity. The steps undertaken to avoid double counting shall be documented in the PDD.

2.3. Entry into forces

10. The date of entry into force is the date of the publication of the EB 87 meeting report on the 27 November 2015.

3. Normative references

11. Project participants shall apply the “General guidelines for SSC CDM methodologies”.

12. This methodology also refers to the latest approved versions of the following approved methodologies and tools:

(a) “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”;

(b) “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”;

(c) “Tool to calculate the emission factor for an electricity system”.

[3] Flights with deferred APU failure, i.e. aircraft operation without APU for limited days, depending on prescription under maintenance manual, are considered abnormal operations

4. Definitions

13. The definitions contained in the Glossary of CDM terms shall apply.

14. In addition, for the purpose of this methodology, the following definitions apply:

(a) **At-gate operations:** commences as soon as the aircraft engine(s) is shut-off upon landing and terminates at engine start-up. The aircraft may either be connected to passenger loading bridges or standing in the open. The at-gate ground handling operations for this methodology is limited to ground power and pre-conditioned air delivery to aircraft during its ground time;

(b) **Auxiliary power unit (APU):** small gas-turbine engine coupled to an electrical generator and used to provide electrical and pneumatic power to aircraft systems when required. It is normally mounted in the tail cone of the aircraft, behind the rear pressure bulkhead, and runs on kerosene fed from the main fuel tanks. Not all aircraft are fitted with an APU and, though their use on transport category jet aircraft is now almost universal, some turboprops and business jets do not have an APU fitted. APU are used when ground power units are not available or where ground handling operations are dependent of a short turn-around time, i.e. the time from start to stop of at-gate operation for the aircraft. APU for air conditioning can operate in addition to ground power units that supply external pre-conditioned air if required indoor temperature requirement cannot be achieved by ground power units alone;

(c) **Ground power unit (GPU) or external power unit:** A GPU supplies electrical energy to an aircraft during its ground time through a connector near the nose gear. There are two types of GPUs: (a) grid-powered GPU where the electrical energy is supplied either by (i) centralized converters that distribute electrical energy throughout the airport, or (ii) individual converters installed under the passenger loading bridges, or (iii) mobile converter vehicles; and/or(b) Mobile fuel consumption fuel trucks;

(d) **Pre-conditioned air (PCA):** pre-conditioned air, either warm or cold air depending on ambient climatic conditions, is a gate provided alternative to APU supplied either by mobile air conditioning units or from hook-ups at the passenger loading terminal gate. Mobile air conditioning units are fuel consumption PCA trucks whereas PCA supplied by hook-ups at the passenger loading terminal gates are by means of a grid supplied centralized system;

(e) **Airport electricity distribution system (AEDS):** consists of a centralized electrical power distribution network that distribute electrical energy to energy demand centres within the airport facility and whose individual consumption is measured that also measure the supply of electrical energy to meet demands for at-gate operations*;*

(f) **At-gate electrical systems:** Depending on the type of aircraft different types of GPUs can be used. Centralized ground power systems generate aircraft compatible electrical energy in one location, from where it is distributed to each gate. For example, smaller aircraft require 28 Volt direct current GPU systems, whereas larger aircrafts require 400 hertz power supply, which can be supplied

from a centralized location or from equipment provided to the aircraft at-gate or with modifications[4] to supply larger sized aircrafts, e.g. new A380.

5. Baseline methodology

5.1. Project boundary

15. The spatial extent of the project boundary includes the solar photovoltaic units, the existing captive energy generation facilities, facilities generating pre-conditioned air and the facilities at gate consuming energy generated by the project activity.

16. The project boundary also includes the entire geographical reach of fuel consuming mobile generation units that generate electrical energy and pre-conditioned air within the airport facility including all domestic aircrafts serviced by the airport facility. The boundary also extends to all power plants connected physically to the project electricity system[5] that the airport is connected to.

5.2. Baseline scenario

17. Electrical energy supplied by sources listed in paragraph 3 (b), (c) and (d) above are distributed to the “point of use” for both electrical energy and PCA requirements.

18. The electrical energy is supplied to the point of use either through the airport electrical distribution system (AEDS) or directly to the gate. Supply of electrical energy through the AEDS in the baseline is illustrated in Figure-1, whereas supply of electrical energy through a dedicated AEDS in the project is illustrated in Figure 2 below.

[4] When an airport gets approval of being capable of operating a new aircraft model all ground handling services of the airport have been considered. Therefore the relevant GPU/PCA output parameters should meet requirements of aircraft operating manuals issued by aircraft manufacturers.

[5] Refer to the latest approved version of the “Tool to calculate the emission factor for an electricity system” for definition of project electricity system.

Figure 1. Airport facility supplied by grid and/or captive power generation in the baseline

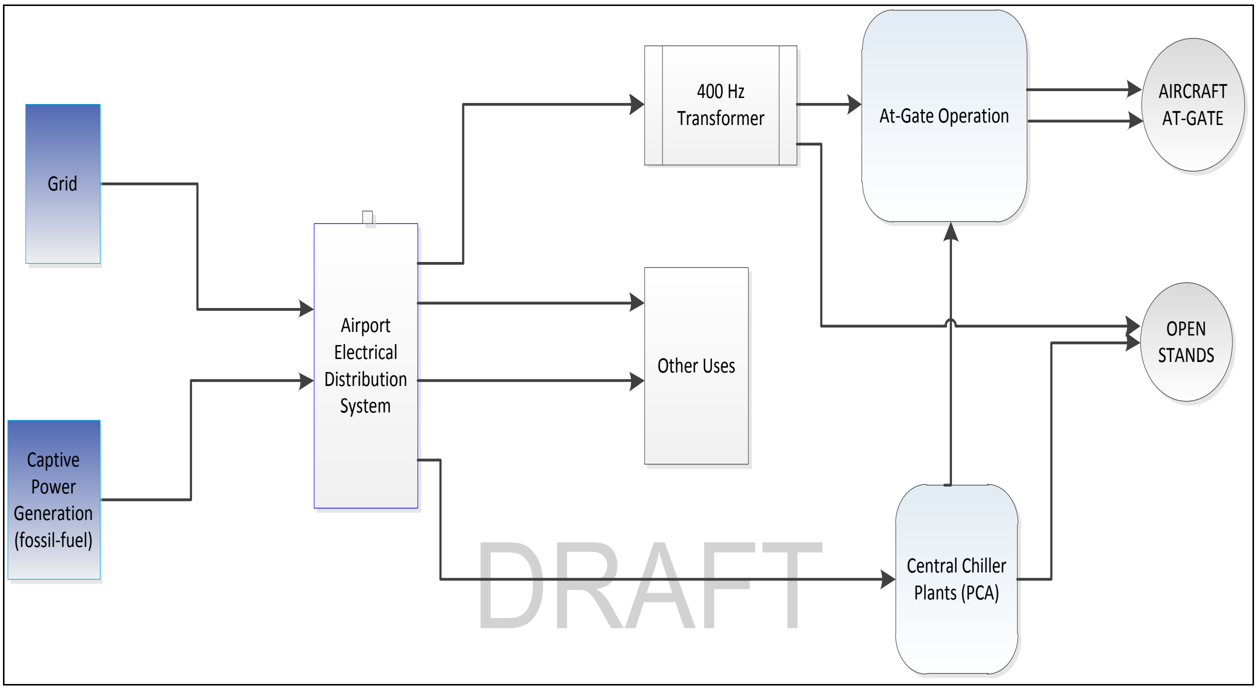
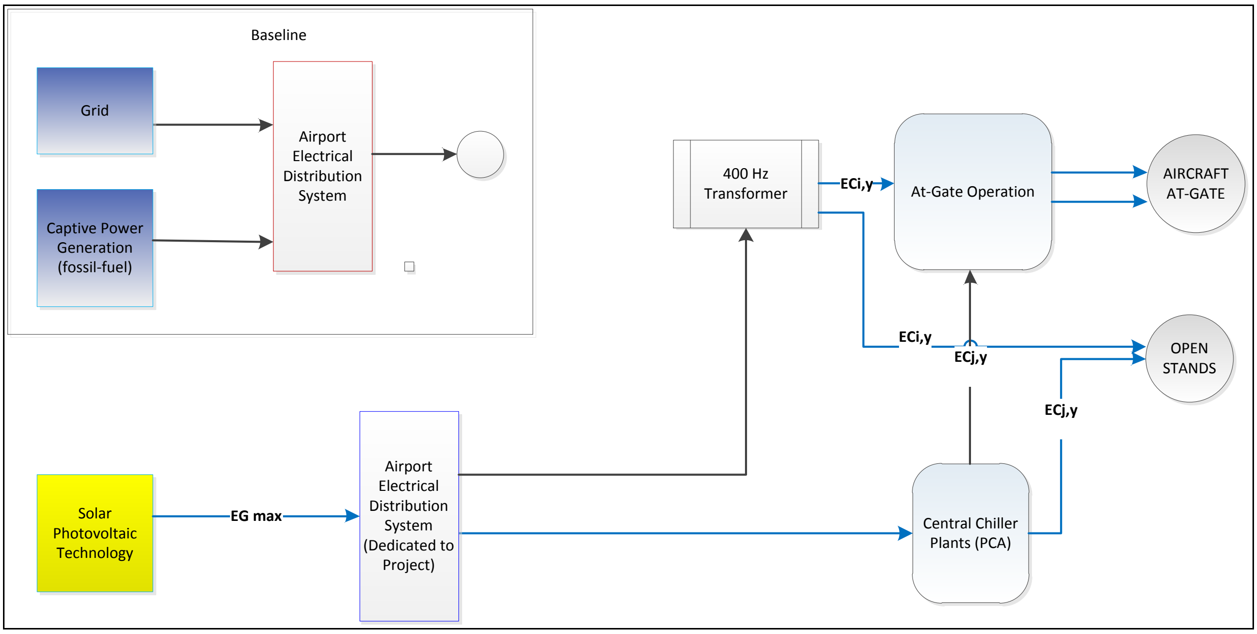


Figure 2. Airport facility supplied by grid and/or captive power generation in the project



19. Electrical energy and PCA supplied either by fuel consuming mobile units and/or by the internal source, i.e. the APU as per paragraph 3 (a) above, are other sources for point of use at at-gate operations.

20. Table 2 below provides a relation between the sources available to provide the services of electrical energy and PCA to aircraft, and the point of use at at-gate operations.

Table 2. Means of providing energy to aircraft at-gate operations

Point of use	**Energy systems for aircraft**	**Aircraft built-in APU**	**Fixed+ GPUs**		**Mobile GPUs**	
	Energy Source(s)	Jet Fuel	Grid	Fuel**	Grid	Fuel**
Electrical energy		✓	✓	✓	✓	✓
PCA		✓	✓	✓	✓	✓

+ Fixed GPUs supplied by electricity include passenger bridges
** Fuel includes both fossil-fuel drive for electricity generation as well as captive generation, e.g. onsite diesel generation sets

21. Table 3 below provides the three scenarios pertaining to the means and range of servicing aircrafts for at-gate operations by airports. The airport service for a large airport can provide aircrafts at-gate a fully equipped gate that provides a full range of options to service the aircrafts. For small airports services may only be provided by aircrafts own internal generation, i.e. APU.

Table 3. Three baseline situations/scenarios are envisaged

Scenario 1: Fully Equipped Gate	**Scenario 2: Partially equipped gate**	**Scenario 3: APU**
▪ **Electricity**: ○ for aircraft electrical equipment by grid/captive generation *and/or* ▪ PCA: ○ from conditioned air heater/Chiller utility plant	▪ Electricity: ○ By **Mobile**/Fixed GPU (grid/captive power): *and/or* ▪ PCA: ○ Mobile GPU (fossil fuel consuming)	▪ Electricity: ○ APU operation *and/or* ▪ PCA: ○ APU operation

Large — Scale of Airport — *Small* →

22. The selection of the applicable baseline scenario and their combination, if any, should be explained and transparently documented in the CDM-PDD.

5.2.1. Baseline emissions

23. Baseline emissions where electrical energy would have been supplied by baseline sources to meet the requirements of aircraft electrical equipment and/or PCA is calculated as follows:

$$BE_y = \min\left(\left(\sum_{i=1}^{l} EC_{i,y} + \sum_{j=1}^{m} EC_{j,y}\right), \left(EG_{i,\max,y} + EG_{j,\max,y}\right)\right) \times EF_{CO2}$$

Equation (1)

Where:

BE_y	=	Baseline emissions in year *y* (kg CO_2)
$EC_{i,y}$	=	Quantity of net electricity consumed by aircraft electrical components *i* for the domestic aircraft at-gate operation for the type and size of aircraft in year *y* (kWh)
l	=	Total number of gates and/or open spaces which consume electrical energy for use by aircraft electrical components in year *y*
$EC_{j,y}$	=	Quantity of net electricity consumed by aircraft pre-conditioned air *j* for domestic aircraft at-gate operation for the type and size of aircraft in year *y* (kWh)
m	=	Total number of gates and/or open spaces which consume electricity to generate pre-conditioned air for the aircraft in year *y*
$EG_{i,\max,y}$	=	Maximum quantity of electricity generated by the Solar photovoltaic installation at project site that was supplied by the project activity and consumed for use by aircraft electrical components *i* for the domestic aircraft at-gate operation for the type and size of aircrafts in year *y* (kWh) The at-gate electricity consumed by aircraft electrical components may either be received from the AEDS and monitored upstream of the AEDS or connected directly to at-gate operations of the airport and monitored at the point of use. If generation is sent to the AEDS a procedure should be in place and described in the PDD to apportion the generation to its use for at-gate operations.
$EG_{j,\max,y}$	=	Maximum quantity of electricity generated by the Solar photovoltaic installation at project site that was supplied by the project activity and consumed for use by aircraft pre-conditioned air *j* for the domestic aircraft at-gate operation for the type and size of aircrafts in year *y* (kWh) The at-gate electricity consumed for aircraft pre-conditioned air generation may either be received from the AEDS and monitored upstream of the AEDS or connected directly to at-gate operations of the airport and monitored at the point of use. If generation is sent to the AEDs a procedure should be in place and described in the PDD to apportion the generation to its use for at-gate operations.

EF_{CO2} = Baseline emission factor ($kgCO_2/kWh$) determined in accordance with section 5.2.2 below

24. Total electricity generated by the CDM project activity shall be compared with the total electricity consumption for at-gate operations by domestic aircrafts in year *y*, and the eligible quantity of electricity for claiming emission reductions should always be the minimum between the electricity generated by the renewable energy system to that of the total electricity consumed for all applications (i.e. electricity and PCA).

5.2.2. Determination of the baseline emission factor (EF_{CO2})

25. Table 4 below illustrates the various means to determine the baseline emission factor compared to the baseline sources for each of the two services provided by airport to aircrafts at-gate (i.e. electricity and PCA).

Table 4. Emission factor based on baseline energy systems that service the aircraft

Baseline source of emission	**Emission factor based on baseline energy systems that service the aircraft**	
	Electricity consumed at-gate	PCA consumed at-gate
Jet fuel	APU	APU
Diesel	▪ Mobile fuel consumption GPU	▪ Mobile fuel consumption air conditioning unit
Grid	▪ Mobile GPU (underground cable/open stands) ▪ Fully supported Passenger bridge	▪ Central chiller/Heat facility ▪ Mobile air conditioning units (extendable cables to supply PCA for open stands)
Captive generation	▪ Mobile GPU (underground cable/open stands) ▪ Fully supported Passenger bridge	▪ Central chiller/Heat facility ▪ Mobile air conditioning units (extendable cables to supply PCA for open stands)

26. The estimation of baseline emission factor of the baseline source of net electricity consumed by aircraft electrical components *i* and the baseline source of net electricity consumed by aircraft pre-conditioned air *j* that would be supplied by the CDM project activity is explained below.

27. The baseline emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” and for PCA it would be calculated based on the duration of time that the APU is in operation, and the fuel consumption rate.

5.2.2.1. Baseline scenario 1 – a fully equipped gate

28. For a fully equipped gate the emission factor could consist of a combination of proportion of electrical energy consumed by domestic flights separately for electricity and pre-conditioned air supplied by grid and/or captive generation, including mobile fuel consuming units or auxiliary power units, as and where applicable.

29. The emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D.

30. Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the "Tool to calculate baseline, project and/or leakage emissions from electricity consumption".

31. For mobile fuel consuming units and APUs (refer to section 5.2.2.3 below for APU) the emission factor should be separately estimated for the at-gate operation time for supply of electricity and/or preconditioned air, based on the associated fuel and efficiency of the motor/generator.

32. Where historical information is available, the baseline emission factor should reflect the proportional distribution of the respective sources with the emissions intensity of the grid, captive power plant, mobile consumption units and APU usage for at least one year period prior to the start date of the project activity, i.e. the weighted average emission factor for the displaced electricity is calculated[6] using values based on the historical consumption of electricity used from grid, captive plants, mobile consuming units and APU.

33. In cases where historical information is not available or the project proponent chooses not to use historical data, the baseline emission factor shall be the minimum between the respective sources of emission intensity between the grid, captive power plant, mobile consuming units and APU. The emission factor for mobile consuming units and APU should be gathered from the optimum manufacturer design values. The information to arrive at the most conservative emission intensity between these sources shall be transparently documented in the PDD.

5.2.2.2. Baseline scenario 2 – partially equipped gate (grid/captive powered GPUs and/or Mobile fuel consumption GPU/PCA)

34. Where airports are catered by both mobile units and mobile fuel consuming units, the emission factor for mobile units that supply either grid and/or captive generated power to at-gate operations shall be calculated as described above. This includes situations where mobile units of GPU and PCA are used to replace APU.

35. For mobile fuel consuming units the emission factor should be separately estimated for the at-gate operation time for supply of electricity and/or preconditioned air, based on the associated fuel and efficiency of the motor/generator.

36. Where historical information is available, the baseline emission factor should reflect the proportional distribution of the respective sources with the emissions intensity of the grid and/or captive power plant and/or mobile fuel consumption units for at least one year period prior to the start date of the project activity.

37. In cases where historical information is not available or the project proponent wishes not to choose this option to use historical data, the baseline emission factor shall be the minimum between the respective sources of emission intensity between the grid, captive

[6] For example if in the baseline the annual electricity requirement for at-gate operations was met by grid import (30 per cent), captive generation (30 per cent), mobile fuel consuming units (30 per cent) and the remaining by APUs the weighted average emission factor (EF_{CO2}) would be 0.3 EF_{grid} + 0.3 $EF_{captive}$.+ 0.3 $EF_{mobile\text{-}units}$.+ 0.1 EF_{APU}.

power plant, mobile consuming units and APU. The information to arrive at the most conservative emission intensity between these sources shall be transparently documented in the PDD.

5.2.2.3. Baseline scenario 3 – APU running to supply both electricity and PCA

38. The APU can supply either electricity or PCA or both for the duration of time the domestic flight is at the gate at airports where the at-gate infrastructure is not available or is limited prior to the implementation of the project activity.

39. Where the data on the historical use of APU is available for the domestic aircraft types operating at the airport, the duration of time that the APU is in operation, the fuel consumption rate[7], type of fuel and the type of aircraft, should be determined for the historical at least one year prior to the start date of the project activity.

40. Where the data on historical use of APU and proprietary APU engine-specific values is not available a default emission factor[8] value of 1.3 kgCO_2/kWh shall be used. This value is established on the basis of representative values for APU operation for each aircraft operation[9], the most conservative aviation fuel emission factor[10] and the highest efficiency of APU operation[11].

5.3. Project emissions

41. For solar PV project activities, PE_y = 0.

42. CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”.

5.4. Leakage

43. No leakage considered.

5.5. Emission reductions

44. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \qquad \text{Equation (2)}$$

[7] Use proprietary engine-specific values obtained from APU manufacturers

[8] Project proponents may submit new proposals and approaches to establish the default emission factor

[9] Table 3-A1-3 of document “Airport Quality Manual”, ICAO 2011 <http://www.icao.int/publications/Documents/9889_cons_en.pdf>.

[10] Table 3.6.4: CO2 emission factors, volume 2 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The results is multiplied by a conservativeness factor selected (0.73) to account for the uncertainty range as contained within document FCCC/SBSTA/2003/10/Add.2.

[11] A highest efficiency of 14% is selected since operation of aircraft APU has a low efficiency rate of 8-14% (*Aircraft Ground Energy Systems at Zurich Airport*).

Where:

ER_y	=	Emission reductions in year *y* (t CO_2)
BE_y	=	Baseline emissions in year *y* (t CO_2)
PE_y	=	Project emissions in year *y* (t CO_2)
LE_y	=	Leakage emissions in year *y* (t CO_2)

6. Monitoring methodology

6.1. Data and parameters monitored

Data / Parameter table 1.

Data / Parameter:	***I***
Data unit:	number
Description:	Total number of gates and/or open spaces which consume electrical energy for use by aircraft electrical components in year *y*
Measurement procedures (if any):	All domestic aircrafts serviced by GPUs, fixed and/or mobile, including APUs
Monitoring frequency:	at least one year historical average
Any comment:	-

Data / Parameter table 2.

Data / Parameter:	***M***
Data unit:	Number
Description:	Total number of gates and/or open spaces which consume electricity for generation of aircraft pre-conditioned air in year *y*
Measurement procedures (if any):	All domestic aircrafts serviced by GPUs, fixed and/or mobile, including APUs
Monitoring frequency:	at least one year historical average
Any comment:	-

Data / Parameter table 3.

Data / Parameter:	$EC_{i,y}$
Data unit:	kWh
Description:	Quantity of net electricity consumed by aircraft electrical components *i* for the domestic aircraft at-gate operation for the type and size of aircraft in year *y* (kWh)
Measurement procedures (if any):	Measurements are undertaken using meters located upstream of the AEDS and also at point of use. Calibration should be undertaken as prescribed in the relevant paragraph of the “General guidelines for SSC CDM methodologies”.

Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording and aggregated for the year
Any comment:	-

Data / Parameter table 4.

Data / Parameter:	$EC_{j,y}$
Data unit:	kWh
Description:	Quantity of net electricity consumed by aircraft pre-conditioned air *j* for domestic aircraft at-gate operation for the type and size of aircraft in year *y*
Measurement procedures (if any):	Measurements are undertaken using meters located upstream of the AEDS and also at point of use. Calibration should be undertaken as prescribed in the relevant paragraph of the “General guidelines for SSC CDM methodologies”.
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording and aggregated for the year
Any comment:	-

Data / Parameter table 5.

Data / Parameter:	$EG_{i,\max,y}$
Data unit:	kWh
Description:	Maximum quantity of electricity generated by the Solar photovoltaic installation at project site that was supplied by the project activity and consumed for use by aircraft electrical components *i* for the domestic aircraft at-gate operation for the type and size of aircrafts in year *y*
Measurement procedures (if any):	Measurements are undertaken using meters located at point of use. Calibration should be undertaken as prescribed in the relevant paragraph of the “General guidelines for SSC CDM methodologies”. The at-gate electricity consumed by aircraft electrical components may either be received from the AEDs and monitored upstream of the AEDs or connected directly to at-gate operations of the airport and monitored at the point of use. If generation is sent to the AEDs a procedure should be in place and described in the PDD to apportion the generation to its use for at-gate operations. The net electricity displaced is the gross energy generation by the project activity power plant minus the auxiliary/station electricity consumption
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording and aggregated for the year

Data / Parameter table 6.

Data / Parameter:	$EG_{j,\max,y}$
Data unit:	kWh

Description:	Maximum quantity of electricity generated by the Solar photovoltaic installation at project site that was supplied by the project activity and consumed for use by aircraft electrical components *i* for the domestic aircraft at-gate operation for the type and size of aircrafts in year *y*
Measurement procedures (if any):	Measurements are undertaken using meters located at point of use. Calibration should be undertaken as prescribed in the relevant paragraph of the "General guidelines for SSC CDM methodologies". The at-gate electricity consumed by aircraft electrical components may either be received from the AEDs and monitored upstream of the AEDs or connected directly to at-gate operations of the airport and monitored at the point of use. If generation is sent to the AEDs a procedure should be in place and described in the PDD to apportion the generation to its use for at-gate operations. The net electricity displaced is the gross energy generation by the project activity power plant minus the auxiliary/station electricity consumption
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording and aggregated for the year

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Document information

Version	*Date*	*Description*
01.0	19 October 2015	SSC WG 49, Annex 01 To be considered by the Board at EB 87. This draft methodology was available for public input from 11 July to 8 August 2015. No input was received.

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Document Type: Standard
Business Function: Methodology
Keywords: aviation, renewable energy generation, simplified methodologies, thermal energy production

Appendix 2. Option 2 – Project activity covering international aircrafts

1. Introduction

1. The following table describes the key elements of the methodology.

Table 5. Methodology key elements

Typical project(s)	Production of electricity using solar photovoltaic technology that supply electrical energy for aircraft at-gate operations in airports
Type of GHG emissions mitigation action	Renewable energy. Displacement of energy that would be provided to the airports for at-gate operation by GHG-intensive means (grid, fossil fuel)

2. Scope, applicability, and entry into force

2.1. Scope

2. This methodology comprises renewable energy generation from solar photovoltaic technology that supply electrical energy to airports for aircraft at-gate operations. The methodology does not allow claiming emission reductions from reducing consumption from international bunker fuels.

3. The project activity shall displace energy demand for electricity and pre-conditioned air from both external and internal generation that is or would have been supplied by at least one fossil fuel generating unit, i.e. in the absence of the project activity the users would have been supplied electricity from one of the sources listed below:

(a) Auxiliary Power Unit (APU);

(b) Ground Power Unit (GPU);

(c) A national or a regional grid (grid hereafter); and/or

(d) Fossil fuel fired captive power plant(s).[12]

2.2. Applicability

4. The methodology is applicable to project activities that:

(a) Install a new solar photovoltaic system (Greenfield plant) at an airport facility where no onsite renewable energy power generation capacities exists prior to implementation of the project activity that supplies power to the airport’s at-gate operations;

[12] Where the users of the captive electricity may also be connected to the grid in the project site.

(b) Supply electricity and/or pre-conditioned air to the airplane at gate through use of solar power that partially or fully replaces those of external power sources connected to the airplane or internal power sources, i.e. with only engine generator (APU) running;

(c) Supply electricity to an airport electricity distribution system (AEDS), as and where applicable, that services at-gate operations. This AEDS supplied by the project is not connected to grid and/or captive generation.

5. If the unit added has both renewable and non-renewable components (e.g. solar and diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component.

6. The methodology is only applicable to claim emission reductions for supply and displacement of electrical energy and pre-conditioned air for at-gate operations, i.e. the point of use, where these services are utilized by the aircraft.

7. The methodology is not applicable where the output of the project activity is supplied to the grid. For projects of grid connected renewable electricity supply, project proponents may choose to apply the latest version of the approved methodology of “AMS-I.D: Grid connected renewable electricity generation”.

8. The methodology is not applicable to abnormal[13] and/or emergency at-gate operations.

9. Project participant should ensure through a contractual agreement with the end-user(s) of solar electricity that the end-user(s) do not claim emission reductions from using it through a separate CDM project activity. The steps undertaken to avoid double counting shall be documented in the PDD.

2.3. Entry into forces

10. The date of entry into force is the date of the publication of the EB 88 meeting report on the 11 March 2016.

3. Normative references

11. Project participants shall apply the “General guidelines for SSC CDM methodologies”.

12. This methodology also refers to the latest approved versions of the following approved methodologies and tools:

(a) “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”;

(b) “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”;

(c) “Tool to calculate the emission factor for an electricity system”.

[13] Flights with deferred APU failure, i.e. aircraft operation without APU for limited days, depending on prescription under maintenance manual, are considered abnormal operations

4. Definitions

13. The definitions contained in the Glossary of CDM terms shall apply.

14. In addition, for the purpose of this methodology, the following definitions apply:

(a) **At-gate operations:** commences as soon as the aircraft engine(s) is shut-off upon landing and terminates at engine start-up. The aircraft may either be connected to passenger loading bridges or standing in the open. The at-gate ground handling operations for this methodology is limited to ground power and pre-conditioned air delivery to aircraft during its ground time;

(b) **Auxiliary power unit (APU):** small gas-turbine engine coupled to an electrical generator and used to provide electrical and pneumatic power to aircraft systems when required. It is normally mounted in the tail cone of the aircraft, behind the rear pressure bulkhead, and runs on kerosene fed from the main fuel tanks. Not all aircraft are fitted with an APU and, though their use on transport category jet aircraft is now almost universal, some turboprops and business jets do not have an APU fitted. APU are used when ground power units are not available or where ground handling operations are dependent of a short turn-around time, i.e. the time from start to stop of at-gate operation for the aircraft. APU for air conditioning can operate in addition to ground power units that supply external pre-conditioned air if required indoor temperature requirement cannot be achieved by ground power units alone;

(c) **Ground power unit (GPU) or external power unit:** A GPU supplies electrical energy to an aircraft during its ground time through a connector near the nose gear. There are two types of GPUs: (a) grid-powered GPU where the electrical energy is supplied either by (i) centralized converters that distribute electrical energy throughout the airport, or (ii) individual converters installed under the passenger loading bridges, or (iii) mobile converter vehicles; and/or(b) Mobile fuel consumption fuel trucks;

(d) **Pre-conditioned air (PCA):** pre-conditioned air, either warm or cold air depending on ambient climatic conditions, is a gate provided alternative to APU supplied either by mobile air conditioning units or from hook-ups at the passenger loading terminal gate. Mobile air conditioning units are fuel consumption PCA trucks whereas PCA supplied by hook-ups at the passenger loading terminal gates are by means of a grid supplied centralized system;

(e) **Airport electricity distribution system (AEDS):** consists of a centralized electrical power distribution network that distribute electrical energy to energy demand centres within the airport facility and whose individual consumption is measured that also measure the supply of electrical energy to meet demands for at-gate operations*;*

(f) **At-gate electrical systems:** Depending on the type of aircraft different types of GPUs can be used. Centralized ground power systems generate aircraft compatible electrical energy in one location, from where it is distributed to each gate. For example, smaller aircraft require 28 Volt direct current GPU systems, whereas larger aircrafts require 400 hertz power supply, which can be supplied

from a centralized location or from equipment provided to the aircraft at-gate or with modifications[14] to supply larger sized aircrafts, e.g. new A380.

5. Baseline methodology

5.1. Project boundary

15. The spatial extent of the project boundary includes the solar photovoltaic units, the existing captive energy generation facilities, facilities generating pre-conditioned air and the facilities at gate consuming energy generated by the project activity.

16. The project boundary also includes the entire geographical reach of fuel consuming mobile generation units that generate electrical energy and pre-conditioned air within the airport facility including all aircrafts serviced by the airport facility. The boundary also extends to all power plants connected physically to the project electricity system[15] that the airport is connected to.

5.2. Baseline scenario

17. Electrical energy supplied by sources listed in paragraph 3 (b), (c) and (d) above are distributed to the “point of use” for both electrical energy and PCA requirements.

18. The electrical energy is supplied to the point of use either through the airport electrical distribution system (AEDS) or directly to the gate. Supply of electrical energy through the AEDS in the baseline is illustrated in Figure-1, whereas supply of electrical energy through a dedicated AEDS in the project is illustrated in Figure 2 below.

[14] When an airport gets approval of being capable of operating a new aircraft model all ground handling services of the airport have been considered. Therefore the relevant GPU/PCA output parameters should meet requirements of aircraft operating manuals issued by aircraft manufacturers.

[15] Refer to the latest approved version of the “Tool to calculate the emission factor for an electricity system” for definition of project electricity system.

Figure 3. Airport facility supplied by grid and/or captive power generation in the baseline

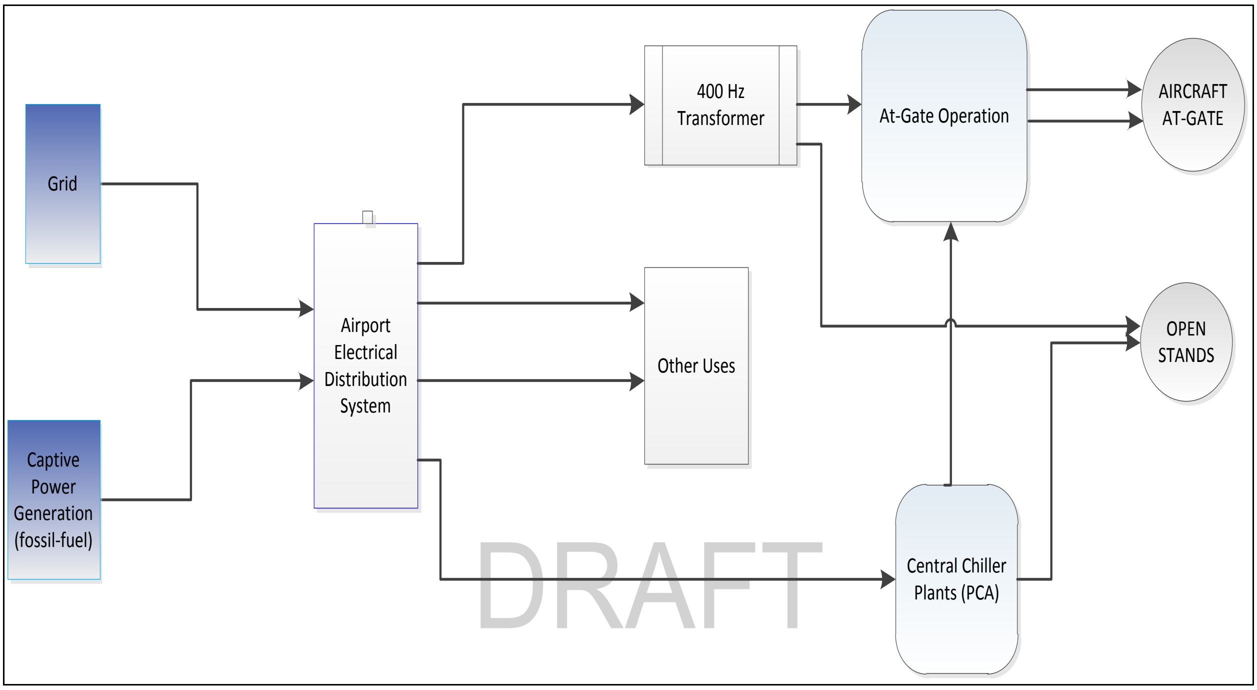
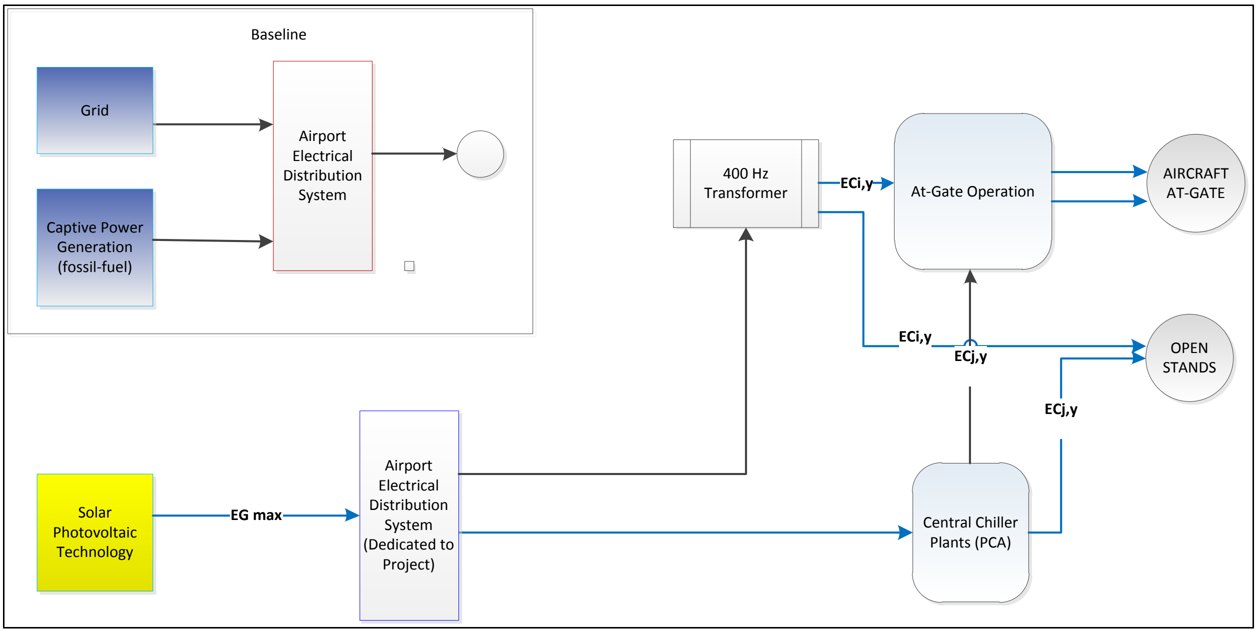


Figure 4. Airport facility supplied by grid and/or captive power generation in the project



19. Electrical energy and PCA supplied either by fuel consuming mobile units and/or by the internal source, i.e. the APU as per paragraph 3 (a) above, are other sources for point of use at at-gate operations.

20. Table 2 below provides a relation between the sources available to provide the services of electrical energy and PCA to aircraft, and the point of use at at-gate operations.

Table 6. Means of providing energy to aircraft at-gate operations

Point of use	**Energy systems for aircraft**	**Aircraft built-in APU**	**Fixed+ GPUs**		**Mobile GPUs**	
	Energy Source(s)	Jet Fuel	Grid	Fuel**	Grid	Fuel**
Electrical energy		✓	✓	✓	✓	✓
PCA		✓	✓	✓	✓	✓

\+ Fixed GPUs supplied by electricity include passenger bridges
** Fuel includes both fossil-fuel drive for electricity generation as well as captive generation, e.g. onsite diesel generation sets

21. Table 3 below provides the three scenarios pertaining to the means and range of servicing aircrafts for at-gate operations by airports. The airport service for a large airport can provide aircrafts at-gate a fully equipped gate that provides a full range of options to service the aircrafts. For small airports services may only be provided by aircrafts own internal generation, i.e. APU.

Table 7. Three baseline situations/scenarios are envisaged

Scenario 1: Fully Equipped Gate	**Scenario 2: Partially equipped gate**	**Scenario 3: APU**
▪ **Electricity**: ○ for aircraft electrical equipment by grid/captive generation *and/or* ▪ PCA: ○ from conditioned air heater/Chiller utility plant	▪ Electricity: ○ By **Mobile**/Fixed GPU (grid/captive power): *and/or* ▪ PCA: ○ Mobile GPU (fossil fuel consuming)	▪ Electricity: ○ APU operation *and/or* ▪ PCA: ○ APU operation

Large — Scale of Airport → *Small*

22. The selection of the applicable baseline scenario and their combination, if any, should be explained and transparently documented in the CDM-PDD.

5.2.1. Baseline emissions

23. Baseline emissions where electrical energy would have been supplied by baseline sources to meet the requirements of aircraft electrical equipment and/or PCA is calculated as follows:

$$BE_y = \min\left(\left(\sum_{i=1}^{l} EC_{i,y} + \sum_{j=1}^{m} EC_{j,y}\right), \left(EG_{i,\max,y} + EG_{j,\max,y}\right)\right) \times EF_{CO2} \times ALBLenergysystem$$ E

Where:

BE_y	=	Baseline emissions in year *y* (kg CO_2)
$EC_{i,y}$	=	Quantity of net electricity consumed by aircraft electrical components *i* for the aircraft at-gate operation for the type and size of aircraft in year *y* (kWh)
l	=	Total number of gates and/or open spaces which consume electrical energy for use by aircraft electrical components in year *y*
$EC_{j,y}$	=	Quantity of net electricity consumed by aircraft pre-conditioned air *j* for aircraft at-gate operation for the type and size of aircraft in year *y* (kWh)
m	=	Total number of gates and/or open spaces which consume electricity to generate pre-conditioned air for the aircraft in year *y*
$EG_{i,\max,y}$	=	Maximum quantity of electricity generated by the Solar photovoltaic installation at project site that was supplied by the project activity and consumed for use by aircraft electrical components *i* for the aircraft at-gate operation for the type and size of aircrafts in year *y* (kWh) The at-gate electricity consumed by aircraft electrical components may either be received from the AEDS and monitored upstream of the AEDS or connected directly to at-gate operations of the airport and monitored at the point of use. If generation is sent to the AEDS a procedure should be in place and described in the PDD to apportion the generation to its use for at-gate operations.
$EG_{j,\max,y}$	=	Maximum quantity of electricity generated by the Solar photovoltaic installation at project site that was supplied by the project activity and consumed for use by aircraft pre-conditioned air *j* for the aircraft at-gate operation for the type and size of aircrafts in year *y* (kWh) The at-gate electricity consumed for aircraft pre-conditioned air generation may either be received from the AEDS and monitored upstream of the AEDS or connected directly to at-gate operations of the airport and monitored at the point of use. If generation is sent to the AEDs a procedure should be in place and described in the PDD to apportion the generation to its use for at-gate operations.
EF_{CO2}	=	Baseline emission factor (kgCO_2/kWh) determined in accordance with section 5.2.2 below

$AF_{BL\ energy\ system}$ = Adjustment factor to discount the use of fuel consumption in auxiliary power units of international flights in baseline, determined in accordance with section 5.2.2 below

24. Total electricity generated by the CDM project activity shall be compared with the total electricity consumption for at-gate operations by aircrafts in year *y*, and the eligible quantity of electricity for claiming emission reductions should always be the minimum between the electricity generated by the renewable energy system to that of the total electricity consumed for all applications (i.e. electricity and PCA).

5.2.2. Determination of the baseline emission factor (*EF_{CO2}*)

25. Table 4 below illustrates the various means to determine the baseline emission factor compared to the baseline sources for each of the two services provided by airport to aircrafts at-gate (i.e. electricity and PCA).

Table 8. Emission factor based on baseline energy systems that service the aircraft

Baseline source of emission	**Emission factor based on baseline energy systems that service the aircraft**	
	Electricity consumed at-gate	PCA consumed at-gate
Jet fuel	APU	APU
Diesel	▪ Mobile fuel consumption GPU	▪ Mobile fuel consumption air conditioning unit
Grid	▪ Mobile GPU (underground cable/open stands) ▪ Fully supported Passenger bridge	▪ Central chiller/Heat facility ▪ Mobile air conditioning units (extendable cables to supply PCA for open stands)
Captive generation	▪ Mobile GPU (underground cable/open stands) ▪ Fully supported Passenger bridge	▪ Central chiller/Heat facility ▪ Mobile air conditioning units (extendable cables to supply PCA for open stands)

26. The estimation of baseline emission factor of the baseline source of net electricity consumed by aircraft electrical components *i* and the baseline source of net electricity consumed by aircraft pre-conditioned air *j* that would be supplied by the CDM project activity is explained below.

27. The baseline emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption” and for PCA it would be calculated based on the duration of time that the APU is in operation, and the fuel consumption rate.

28. The duration of flight served by all the baseline energy systems to service aircraft shall be monitored for a year prior to the implementation of the project activity. The baseline duration served by jet fuel in domestic aircrafts, jet fuel in international aircraft, Diesel and other fossil fuel based captive energy sources, and grid energy sources. The proportion shall be determined through the duration (hours) of grid, captive power plant,

mobile consumption units and APU operation for international flights, out of the total duration of time (hour) when all international and domestic flights are using the at gate services. The duration served by the jet fuel in international aircraft is discounted from emission reductions estimations.

5.2.2.1. Baseline scenario 1 – a fully equipped gate

29. For a fully equipped gate the emission factor could consist of a combination of proportion of electrical energy consumed by flights separately for electricity and pre-conditioned air supplied by grid and/or captive generation, including mobile fuel consuming units or auxiliary power units, as and where applicable.

30. The emission factor of a grid shall be calculated as per the procedures provided in AMS-I.D.

31. Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”.

32. For mobile fuel consuming units and APUs (refer to section 5.2.2.3 below for APU) the emission factor should be separately estimated for the at-gate operation time for supply of electricity and/or preconditioned air, based on the associated fuel and efficiency of the motor/generator.

33. , the baseline emission factor should reflect the proportional distribution of the respective sources with the emissions intensity of the grid, captive power plant, mobile consumption units and APU usage for at least one year period prior to the start date of the project activity, i.e. the weighted average emission factor for the displaced electricity is calculated[16] using values based on the historical consumption of electricity used from grid, captive plants, mobile consuming units and APU.

34. In cases where historical information other than duration of the aircraft serviced by different energy sources is not available or the project proponent chooses not to use historical data, the baseline emission factor shall be the minimum between the respective sources of emission intensity between the grid, captive power plant, mobile consuming units and APU. The emission factor for mobile consuming units and APU should be gathered from the optimum manufacturer design values. The information to arrive at the most conservative emission intensity between these sources shall be transparently documented in the PDD.

5.2.2.2. Baseline scenario 2 – partially equipped gate (grid/captive powered GPUs and/or Mobile fuel consumption GPU/PCA)

35. Where airports are catered by both mobile units and mobile fuel consuming units, the emission factor for mobile units that supply either grid and/or captive generated power to at-gate operations shall be calculated as described above. This includes situations where mobile units of GPU and PCA are used to replace APU.

[16] For example if in the baseline the annual electricity requirement for at-gate operations was met by grid import (30 per cent), captive generation (30 per cent), mobile fuel consuming units (30 per cent) and the remaining by APUs the weighted average emission factor (EF_{CO2}) would be 0.3 EF_{grid} + 0.3 $EF_{captive}$.+ 0.3 $EF_{mobile\text{-}units}$.+ 0.1 EF_{APU}.

36. For mobile fuel consuming units the emission factor should be separately estimated for the at-gate operation time for supply of electricity and/or preconditioned air, based on the associated fuel and efficiency of the motor/generator.

37. The baseline emission factor should reflect the proportional distribution of the respective sources with the emissions intensity of the grid and/or captive power plant and/or mobile fuel consumption units for at least one year period prior to the start date of the project activity.

38. In cases where historical information other than duration of the aircraft serviced by different energy sources is not available or the project proponent wishes not to choose this option to use historical data, the baseline emission factor shall be the minimum between the respective sources of emission intensity between the grid, captive power plant, mobile consuming units and APU. The information to arrive at the most conservative emission intensity between these sources shall be transparently documented in the PDD.

5.2.2.3. Baseline scenario 3 – APU running to supply both electricity and PCA

39. The APU can supply either electricity or PCA or both for the duration of time the flight is at the gate at airports where the at-gate infrastructure is not available or is limited prior to the implementation of the project activity.

40. The historical use of APU for the aircraft types operating at the airport, the duration of time that the APU is in operation, the fuel consumption rate[17], type of fuel and the type of aircraft, should be determined for the historical at least one year prior to the start date of the project activity. Where the proprietary APU engine-specific values are not available, a default emission factor[18] value of 1.3 kgCO_2/kWh shall be used. This value is established on the basis of the most conservative aviation fuel emission factor[19] and the highest efficiency of APU operation[20].

5.3. Project emissions

41. For solar PV project activities, PE_y = 0.

42. CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the “Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion”.

5.4. Leakage

43. No leakage considered.

[17] Use proprietary engine-specific values obtained from APU manufacturers

[18] Project proponents may submit new proposals and approaches to establish the default emission factor

[19] Table 3.6.4: CO2 emission factors, volume 2 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories. The result is multiplied by a conservativeness factor selected (0.73) to account for the uncertainty range as contained within document FCCC/SBSTA/2003/10/Add.2.

[20] A highest efficiency of 14% is selected since operation of aircraft APU has a low efficiency rate of 8-14% (*Aircraft Ground Energy Systems at Zurich Airport*).

5.5. Emission reductions

44. Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y \quad \text{Equation (4)}$$

Where:

ER_y	=	Emission reductions in year *y* (t CO_2)
BE_y	=	Baseline emissions in year *y* (t CO_2)
PE_y	=	Project emissions in year *y* (t CO_2)
LE_y	=	Leakage emissions in year *y* (t CO_2)

6. Monitoring methodology

6.1. Data and parameters monitored

Data / Parameter table 7.

Data / Parameter:	***I***
Data unit:	number
Description:	Total number of gates and/or open spaces which consume electrical energy for use by aircraft electrical components in year *y*
Measurement procedures (if any):	All aircrafts serviced by GPUs, fixed and/or mobile, including APUs
Monitoring frequency:	at least one year historical average
Any comment:	-

Data / Parameter table 8.

Data / Parameter:	***M***
Data unit:	Number
Description:	Total number of gates and/or open spaces which consume electricity for generation of aircraft pre-conditioned air in year *y*
Measurement procedures (if any):	All aircrafts serviced by GPUs, fixed and/or mobile, including APUs
Monitoring frequency:	at least one year historical average
Any comment:	-

Data / Parameter table 9.

Data / Parameter:	$EC_{i,y}$
Data unit:	kWh
Description:	Quantity of net electricity consumed by aircraft electrical components *i* for the aircraft at-gate operation for the type and size of aircraft in year *y* (kWh)

Measurement procedures (if any):	Measurements are undertaken using meters located upstream of the AEDS and also at point of use. Calibration should be undertaken as prescribed in the relevant paragraph of the “General guidelines for SSC CDM methodologies”.
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording and aggregated for the year
Any comment:	-

Data / Parameter table 10.

Data / Parameter:	$EC_{j,y}$
Data unit:	kWh
Description:	Quantity of net electricity consumed by aircraft pre-conditioned air *j* for aircraft at-gate operation for the type and size of aircraft in year *y*
Measurement procedures (if any):	Measurements are undertaken using meters located upstream of the AEDS and also at point of use. Calibration should be undertaken as prescribed in the relevant paragraph of the “General guidelines for SSC CDM methodologies”.
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording and aggregated for the year
Any comment:	-

Data / Parameter table 11.

Data / Parameter:	$EG_{i,\max,y}$
Data unit:	kWh
Description:	Maximum quantity of electricity generated by the Solar photovoltaic installation at project site that was supplied by the project activity and consumed for use by aircraft electrical components *i* for the aircraft at-gate operation for the type and size of aircrafts in year *y*
Measurement procedures (if any):	Measurements are undertaken using meters located at point of use. Calibration should be undertaken as prescribed in the relevant paragraph of the “General guidelines for SSC CDM methodologies”. The at-gate electricity consumed by aircraft electrical components may either be received from the AEDs and monitored upstream of the AEDs or connected directly to at-gate operations of the airport and monitored at the point of use. If generation is sent to the AEDs a procedure should be in place and described in the PDD to apportion the generation to its use for at-gate operations. The net electricity displaced is the gross energy generation by the project activity power plant minus the auxiliary/station electricity consumption
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording and aggregated for the year

Data / Parameter table 12.

Data / Parameter:	$EG_{j,\max,y}$
Data unit:	kWh
Description:	Maximum quantity of electricity generated by the Solar photovoltaic installation at project site that was supplied by the project activity and consumed for use by aircraft electrical components *i* for the aircraft at-gate operation for the type and size of aircrafts in year *y*
Measurement procedures (if any):	Measurements are undertaken using meters located at point of use. Calibration should be undertaken as prescribed in the relevant paragraph of the “General guidelines for SSC CDM methodologies”. The at-gate electricity consumed by aircraft electrical components may either be received from the AEDs and monitored upstream of the AEDs or connected directly to at-gate operations of the airport and monitored at the point of use. If generation is sent to the AEDs a procedure should be in place and described in the PDD to apportion the generation to its use for at-gate operations The net electricity displaced is the gross energy generation by the project activity power plant minus the auxiliary/station electricity consumption
Monitoring frequency:	Continuous monitoring, hourly measurement and at least monthly recording and aggregated for the year

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Document information

Version	*Date*	*Description*
02.0	22 February 2016	Published as an annex to the annotated agenda of EB88. This draft standard takes into account comments received from the Board at EB87 meeting and input from ICAO.
01.0	19 October 2015	SSC WG 49, Annex 01 To be considered by the Board at EB 87. This draft methodology was available for public input from 11 July to 8 August 2015. No input was received.

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