

### Quality Control (QC) report

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| <b>Sectoral scope</b>  | Power   |
| <b>Name of DNA</b>   | Ministry of Nature Protection of the Republic of Armenia,<br>DNA of Armenia   |
| <b>Primary person for the QC report</b>  | Mr. Aram Gabrielyan, UNFCCC National Focal Point  |
| <b>Contact info of the contact person</b>  | Tel.: (37410) 583932 (ext. 20),<br>Fax: (37410) 583933<br>E-mail: aram@nature.am  |
| <b>Implementation date of QC procedures</b>  | From the date of submission of the SBL "Grid Emission Factor for the Electricity System of the Republic of Armenia for 2016" in August 2017 and for the duration of the SBL after approval. |
| <b>Please describe how the QC procedures were implemented</b>  |   |
| <p>Data collection system was established by the Ministry of Nature Protection of RA (DNA) in collaboration with the group of experts recruited by UNDP Armenia for the purpose of development of the standardized Grid Emission Factor (GEF) for Armenia. The system identifies all baseline data and information on the power generation system and national grid of Armenia necessary for calculation of GEF in line with requirements of the Methodological tool "Tool to calculate the emission factor for an electricity system" Version 05.0., as well as establishes procedure for data systematization and storage. UNDP Armenia supported the DNA with data collection, management and GEF calculation.</p> <p>The data are received from the following two official (state) organizations that are authorized by the legislation of RA to collect, analyze and archive actual information on performance of the power system of the country in line with the legislation of Armenia.</p> <p><u>Public Services Regulatory Commission of RA (PSRC)</u> established on April 3, 1997 by the Order of the President of the Republic of Armenia to implement regulatory and tariff policy in the energy sector of the country. Main functions of the Commission in energy sector are to issue power generation licenses and licenses for power market service provision activities, regulate activities of licensed entities, set end-use tariffs for electrical and thermal energy and gas, establish feed-in tariffs, etc. The Commission is independent from the Government of RA.</p> <p>All licensed entities, including generating units connected to the national grid, are obliged to report to PSRC on their performance indicators on a regular base in line with the provisions of corresponding licenses granted by the Commission. The reports of the power plants are checked by the corresponding departments of PSRC and serve as the base for development of quarterly and annual reports on power system performance communicated to the national energy authority and published on the website of the Commission at <a href="http://www.psrc.am">www.psrc.am</a>.</p> <p>The following information was officially received by the DNA from PSRC via official communication (see attached file "1. Letter to PSRC" with DNA letter №2/05.1/20365-17 dated on 04.04.2017 requesting data from PSRC, and files "3. Letter from PSRC with feedback" and "4. Annex to PSRC letter" with PSRC letter №SK/3.2-32/255-17 dated on 18.04.2017 providing data to the DNA):</p> <ul style="list-style-type: none"> <li>➤ Information clearly identifying natural gas-fired plants / units;</li> <li>➤ Information on plants that connected to the grid most recently;</li> <li>➤ Installed capacities of natural gas-fired power plants;</li> <li>➤ The type and caloric value of fuel used at power plants in the relevant years;</li> <li>➤ The consumption of each fuel type in the relevant years,</li> </ul> <p><u>"Settlement Center" CJSC (SC)</u> of the Ministry of Energy Infrastructures and Natural Resources of RA (MEINR). SC is the state-owned company responsible for measuring and registration of power generation and supply on the wholesale market of the country based on data of commercial meters,</p> |   |

as well as for carrying out relevant financial calculations and analysis necessary for the settlement of accounts between power generating companies and the operator of the national grid (ENA CJSC).

The Center has access to SCADA system that provides actual data on performance of the whole power system including information on generated, delivered, imported, exported and purchased power. It runs comprehensive and advanced software which allows both simultaneous estimation of more than 40 parameters of the grid and power system and archiving the most important data, including half-hourly generation and own consumption for all each of the power plant serving the Armenian energy system. The system ensures high level of reliability, transparency and accountability of data acquisition and requires minimum human involvement, thus, reducing any risk of inaccuracy of data registration and reporting. Based on the available information, the Center develops annual reports on analysis of technical and economic indices of the Armenian power energy system. The Center is the initial official source of information on key performance indicators of the Armenian power system.

The following information was officially received by the DNA from the Settlement Center (through the Ministry of Energy Infrastructures and Natural Resources of RA) via official communication (see attached file “2. Letter to MEINR” with the DNA letter №2/05.1/20365-17 dated on 04.04.2017 requesting data from MEINR, file “5. Letter from MEI&NR with feedback” with Settlement Center’s letter №166MJ dated on 27.04.2017 providing data):

- Annual power generation and power delivered to the grid by each power plant;
- Hourly power generation data for each power plant/unit;
- Annual power export and import;

All data received from the Settlement Center are provided in excel-based format developed by DNA and in line with the respective instruction provided by the DNA (see attached files “6. Monthly power generation data\_2013-2016”, “7. Half-hour power generation data\_2014-2016” and “8. Half-hour power generation data\_2014-2016\_addition” with excel-spreadsheets). Annual reports of the Center on analysis of technical and economic indices of the Armenian power energy system were used to cross-check certain information on plants serving the power system received from PSRC.

Conversion factor for energy (TJ/Gcal) and fuel emission factor are obtained from the respective reports of IPCC (IPCC, Climate Change 2000: Working Group III: Mitigation and IPCC 2006 Guidelines).

Secondary data sources such as publically available reports and statistics not treated under confidentiality has been used to cross-check certain raw data. Cross-checking has been carried out also against data of the currently valid SBL of Armenia.

All collected data are consolidated into excel spreadsheets and archived electronically, together with supporting documents for at least 5 years by the DNA and UNDP Armenia. Initial data obtained by the DNA from the abovementioned official sources are also electronically archived by plant operators, PSRC and Settlement Center. The obtained and processed data will be stored in such a way that allow for the reproduction of the performed calculations.

**Please specify how the credibility of the data sources was checked.**

The data are received directly from the state organizations (PSRC and SC) that within the scope of their competences, defined by the legislation and their statutes, are entitled to collect and manage actual, comprehensive, accurate and traceable information and data on performance of the Armenian power system, and serve as initial sources of information on power system performance for the Government of RA and other state organizations.

PSRC receives information directly from the management of licensed organizations (power producers) in the form of official reports. Settlement Center has direct access to SCADA and commercial metering systems that covers all power generators integrated into the national grid, and receives actual data on power generation and delivery in real-time regime. The system requires minimum human interference, thus, ensuring high creditability of the obtained information.

All initial data used for GEF calculation is available in electronic format in PSRC and SC and can be verified by third party if necessary. Annual reports of SC containing information on electricity generation, delivery, import and export, etc. are available at DNA and have been used for cross-checking of certain data received in excel format (see attached files “9. Annual report of SC for 2014”, “10. Annual report of SC for 2015” and “11. Annual report of SC for 2016”).

DNA considers that the data is comprehensive and creditable as it is received from official sources

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| and is well documented and available for verification.  |
| <b>Please specify how the accuracy of the data was checked.</b>   |
| Data received from PSRC and SC has been cross-checked against information available on the website of the Commission and annual reports on analysis of technical and economic indices of the Armenian power energy system developed by SC. UNDP experts supported data verification with representatives of PSRC and SC through interviews and meetings. No inconsistencies were identified. SC has direct access to SCADA and commercial metering systems, and receives actual data on power generation and delivery in real-time regime. Data incorporated into excel spreadsheets of DNA where transferred by SC directly from the SCADA metering system, thus, minimizing any human interference and possibility of inconsistencies because of manual inputs.   |
| <b>Please specify how the consistency was achieved in particular where multiple secondary data sources were used.</b>   |
| Consistency was achieved by the use of self-explanatory excel data format developed ad hoc , as well as via letters addressed to PSRC and SC containing clear instruction on what kind of data is needed. In addition to the letters and the form, UNDP expert team met with representatives of PSRC and SC to provide individual instructions on scope of requested information and proper input of information. The form submitted to SC requests power plants data (e.g. half-hour data on power generation for individual plants, annual data on power generation and delivery, power export and import, etc.). The letter sent to PSRC provided clear instruction on content and format of needed information e.g. installed capacity in MW, date of commissioning, annual fuel consumption in 1000 m <sup>3</sup> /year, caloric value of fuel in kcal/m <sup>3</sup> . See attached letters and excel spreadsheets.  |
| <b>Please specify how the "Standard for data coverage and validity of standardized baselines" was complied with.</b>  |
| The GEF calculation is based on data on power system for 2014-2016 periods, and is performed in line with requirements of the Methodological tool "Tool to calculate the emission factor for an electricity system" (version 05.0). Data used is the latest available information on power system and grid performance received from reliable state organizations acting in energy sector of Armenia. These include data vintage from 2014, 2015, 2016. Coverage period and correctness of data follow the requirements specified in the standard.  |
| <b>Please specify how the completeness was achieved.</b>  |
| The calculation was performed in compliance with requirements of the latest version of the approved methodological tool "Tool to calculate emission factor of an electricity system" Version 05.0. The tool asks for specific parameters, data and information for the calculation of the emission factor. All the necessary data and information were made available through the above-mentioned official sources and via publicly available information enabling the DNA to produce "true and fair" representative standardized baseline.   |
| <b>Please specify how the transparency was achieved.</b>  |
| Information received from the mentioned sources was sufficient for calculation of the standardized baseline in an efficient, consistent and transparent manner. All initial information used for GEF calculation is stored at DNA (and available at PSRC and SC) and can be made available to the CDM Secretariat and/or a third party on confidentiality condition in a transparent manner if needed.<br><br>Transparency was achieved through a number of meetings and phone communications between expert team of UNDP Armenia involved in GEF calculation and respective specialists of PSRC and Settlement Centre aimed to explain the process of GEF calculation, to clarify scope and format of requested information and provide instruction on data collection spreadsheets, to address uncertainties, etc. Transparency was also achieved during data collection and crosschecking activities and calculation of GEF by continuous communication with relevant national energy authorities. |
| <b>Please specify major issues and uncertainties identified during the QC procedures.</b>   |
| No major uncertainties are identified.  |

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| <b>Please specify major corrective actions taken during the QC procedures.</b>   |
| None. Besides minor issues related to the GEF calculations that was solved rapidly through the consultants and specialists of the Settlement Center and PSRC.  |
| <b>Please justify the conservativeness of the approaches taken during the QC procedures</b>  |
| The approach follows requirements of the valid Methodological tool "Tool to calculate grid emission factor of an electricity system", thus, all conservative measures are already taken into account within the applied tool/methodology. To ensure conservativeness conservative values from different sources were used where applicable.  |
| <b>Please summarize key findings and present a plan to improve the data quality in future</b>  |
| <p>The current data management system follows the procedure for GEF calculation applied for development of SB for Armenia for 2012 (approved by the EB).</p> <p>Starting from 2013 the Settlement Center's" annual reports are developed in local language and are not publicly available. However, they are available for the DNA through the Ministry of Energy Infrastructures and Natural Resources of RA.</p> |

Date to of QC report finalization

01.08.2017