Certificate of Validity

Certificate No. :	PCF 8117332592
Certificate Holder:	Apar Industries Ltd. (APAR) - Unit: Uniflex Cables
Manufacturing Site:	Apar Industries Ltd., (*http://www.apar.com/)* • Plot No. 153, 157-163, Survey No. 189/P1, GIDC Umbergaon, Dist-Valsad, Gujarat-396171, India • Khata No. 2032, Survey No. 6074, Khatalwada Manekpur Road, Village-Khatalwada, Taluka-Umbergaon, Dist-Valsad , Gujarat-396120, India
Product Details:	Please refer Annexure 1 of this Certificate
Report No.:	8117332592
Reference:	ISO 14067:2018 - Greenhouse Gases - Carbon Footprint of Products - Requirements and Guidelines for Quantification
Issued on:	2019-11-04
Valid until:	2020-11-03

The verification of the Product Carbon Footprint (PCF) of the 04 types of cables is carried by the TUV India in accordance with the requirement of International Standard ISO 14067:2018. The scope of the assurance included the verification of GHG emissions for the system boundary of product encompassing “Cradle to Grave” approach. In particular, the assurance engagement included the following:

- The methods used for calculating the PCF are in line with ISO 14067:2018. The methods are scientifically well-founded and meeting the requirements of the standard
- The application of the input parameters, associated emission factors, and principles of calculation as mentioned in the ISO 14067:2018, and allied Standards like ISO 14064-1, GHG protocol, IPCC 2013 GWP 100a V1.02 and thus deemed as adequate, appropriate and well-found with the reference to the objective of the assessment
- The evaluation takes into consideration the objectives of the assessment, limitations, and assumptions which were identified. The PCF calculations are consistent and transparent

The Product details are stated under Annexure-1 and PCF results are given under Annexure-2 of this Certificate.

For TUV India Pvt. Ltd.
2019-11-04

Product Carbon Footprint Verification

Annexure 1 – Product Details

Cable 1	1C X 16 Sq.mm, APC Conductor, XLPE Insulated, PVC Sheathed Cable with Voltage grade of 0.6/1 KV. CU/XLPE/PVC
Country	Chile
Cable size	1C X 16 Sq.mm
Dielectric Loss (W/km)	0.2044
Capacitance (µF/km)	0.452
Maximum Operating Temperature of cable in ^{o}C	90
R_{max} (Ohm/km)	1.472
MW Transferred corresponding to Maximum temperature of cable	0.136

Cable 3	1C X 400 Sq.mm, AAC Conductor, XLPE Insulated, PVC Sheathed Cable with Voltage grade of 0.6/1 KV. AL/XLPE/PVC
Country	Chile
Cable size	1C X 400 Sq.mm
Dielectric Loss (W/km)	0. 3445
Capacitance (µF/km)	0.762
Maximum Operating Temperature of cable in ^{o}C	90
R_{max} (Ohm/km)	0.0995
MW Transferred corresponding to Maximum temperature of cable	0.744

Cable 2	1C X 500 Sq.mm, APC Conductor, XLPE Insulated, PVC Sheathed Cable with Voltage grade of 0.6/1 KV. CU/XLPE/PVC
Country	Peru
Cable size	1C X 500 Sq.mm
Dielectric Loss (W/km)	0.3622
Capacitance (µF/km)	0.801
Maximum Operating Temperature of cable in ^{o}C	90
R_{max} (Ohm/km)	0.04685
MW Transferred corresponding to Maximum temperature of cable	0.829

Cable 4	1C X 400 Sq.mm, AAC Conductor, XLPE Insulated, PVC Sheathed Cable with Voltage grade of 0.6/1 KV. AL/XLPE/PVC
Country	Peru
Cable size	1C X 400 Sq.mm
Dielectric Loss (W/km)	0.3445
Capacitance (µF/km)	0.762
Maximum Operating Temperature of cable in ^{o}C	90
R_{max} (Ohm/km)	0.0995
MW Transferred corresponding to Maximum temperature of cable	0.744

Annexure 2 –Product Carbon Footprint Results

Under the PCF study, below stages were verified:

- GHG emissions on account of material acquisition phase
- Upstream GHG emissions during for procurement of raw material
- GHG Emissions on account of manufacturing phase
- Downstream GHG emissions on account of dispatch of cables to respective host countries
- Use phase GHG emissions
- GHG emissions of account of End of Life

To arrive at the PCF, SAP and plant data were utilized. The latest available and relevant sources of embodied carbon, emission factors, and calculation methodologies were utilized. Exhaustive interviews with members of management, Design, Procurement, Marketing and Dispatch function staff (responsible for data collection and processing) were undertaken. Monitoring tool (formatted worksheets) and processes were verified. PCF results for 1 km of cable are as follows

Cable	Raw material	Transport of raw material	Manufacturing phase1	Transport of cable	Use Phase emissions	Disposal emissions	End of life credits	Net PCF/km
	(tCO2)							
Cable 1: 1C X 16 Sq.mm, APC Conductor, XLPE Insulated, PVC Sheathed Cable with Voltage grade of 0.6/1 KV. CU/XLPE/PVC	**1.6**	**0.03**	**0.35**	**0.28**	**1584**	**0.01**	**0.58**	**1586**
Cable 2 : 1C X 500 Sq.mm, APC Conductor, XLPE Insulated, PVC Sheathed Cable with Voltage grade of 0.6/1 KV. CU/XLPE/PVC	**43.62**	**0.9**	**0.42**	**6.99**	**3798**	**0.12**	**18.62**	**3832**
Cable 3: 1C X 400 Sq.mm, AAC Conductor, XLPE Insulated, PVC Sheathed Cable with Voltage grade of 0.6/1 KV. AL/XLPE/PVC	**38.24**	**0.08**	**0.35**	**1.98**	**4210**	**0.04**	**4.30**	**4247**
Cable 4: 1C X 400 Sq.mm, AAC Conductor, XLPE Insulated, PVC Sheathed Cable with Voltage grade of 0.6/1 KV. AL/XLPE/PVC	**38.24**	**0.08**	**0.35**	**2.07**	**3929**	**0.04**	**4.30**	**3966**

Assumptions and Inclusion

1. Bill of material is utilized for arriving at the Raw material inventory
2. Wherever plant data was not available, the GHG emission sources were not neglected. Instead, conservative assumptions were applied to calculate the emissions
3. Raw material is procured from suppliers who in turn sourced from reputed manufacturing units. The distance for road transport for procurement of raw material from the facility is conservatively taken from the records of the purchase department
4. In the inventory analysis phase, primary data shall be used for facilities and process of APAR facility, involving the compilation and quantification of inputs and outputs for the manufacturing of the product
5. The transport emissions for the finished cables are considered from facility to port of Chile and Peru. Additional road distance of 750 km is assumed for the transportation of cable to its designated location
6. The use phase GHG emissions are limited to the maximum losses (combination of maximum operating temperature and load) determined at the design conditions over entire life span, which is assumed as 20 years
7. Use phase GHG emissions are evaluated by considering the loading of cable at the respective host country with the losses at rated conditions for the entire lifetime
8. Supplier data pertaining to raw material emission, publically available data on the embodied emission factors, internally accepted data bases are utilized for the evaluation of the life cycle CO_2 emission calculations

Exclusions: The system boundary excludes the below

1. There is a negligible process outside the APAR Manufacturing facility thus the GHG emissions on account of ancillary emissions are not applicable
2. The use phase GHG emissions do not envisage spare, oil replacements, etc as the maintenance of the cable is subjected to replacement upon its failure, which cannot be estimated by APAR
3. Open-loop recycling approach has been considered for estimating the end of life and recycling rates for Copper and Aluminium
4. The carbon footprint of the landfill/incineration at the end of life is neglected as credible data for its calculation could not be traced and provisions of the disposal methods after 20 years from now could not be envisaged

[1] *Conservative emissions between both the manufacturing site is considered*