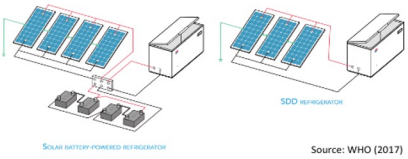


Scope – Off-grid Refrigerators and Ceiling Fans

- The **Off-grid Refrigerator Guidelines** apply to refrigerating appliances, intended for use on, and/or compatible with, off-grid energy systems, including low-voltage direct current (DC) systems, solar home systems (SHS), and DC or AC mini-grids
 - Solar direct drive (SDD) refrigerators, ice-/water-pack refrigerators are included
 - Vaccine refrigerators and walk-in cold rooms are out of the scope
- The **Ceiling Fan Guidelines** apply to fans with blade diameter larger than 900 millimetres, up to and including 1,800 millimetres, where ceiling fans are defined as conventional fans permanently attached to the ceiling of a room with a def for suspension from the ceiling of a room so that the blades rotate in a horizontal plane
- Both products** offered for sale or installed in residential or light commercial applications.

Schematic of battery-powered and SDD refrigerators



Source: WHO (2017)

Typical Ceiling Fan



Performance Requirements – Off-grid Refrigerators

- Temperature:** compartment temperature tolerance +/-1°C at an ambient temperature 43°C
- Pull-down time:** < 8 hours with a 15% tolerance.
- Voltage:** operable in the range of +20%/-10% of the rated voltage.
- Energy performance**

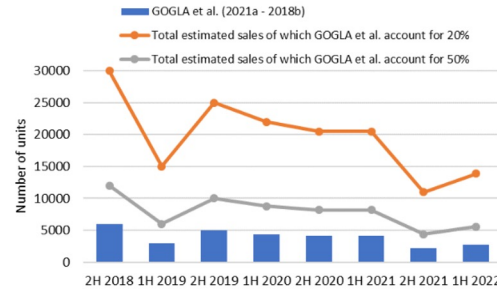
	Reference	High Efficiency Requirements	
		Intermediate	High
Refrigerators	EEl=1.00 R=1.00	EEl=0.65 R=1.54	EEl=0.40 R=2.50
Refrigerator-Freezers	EEl=1.00 R=1.00	EEl=0.85 R=1.17	EEl=0.65 R=1.54
Freezers	EEl=1.00 R=1.00	EEl=0.85 R=1.17	EEl=0.65 R=1.54

Refrigerants and foam-blowing agents

	Maximum	Encouraged
ODP	0	0
GWP	1500	20

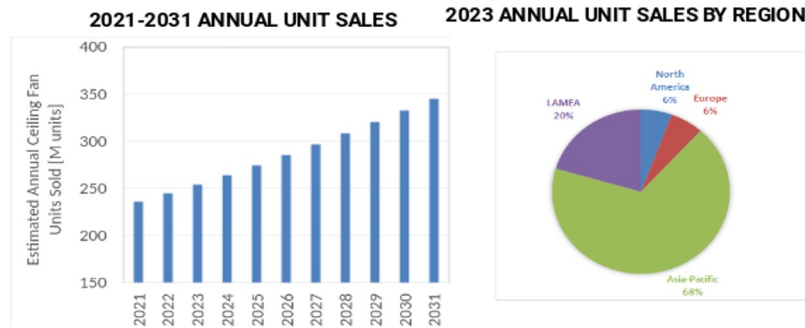
Market – Off-grid appliances

- Lighting Global/ESMAP et al. (2022) provided more comprehensive data on the off-grid appliance market and estimated that a total of 5 million units (fans, TVs, solar water pumps, and refrigerating appliances) sold in 2021.
- Based on assumptions from the report, the annual sales of off-grid refrigerating appliances in 2021 were between 12,600 and 31,500 units, far smaller than for grid-connected units.



Market – Ceiling Fans

- Ceiling fans annual units sales of about 250 million units in 2023, increasing to around 350 million units in 2031, with an annual growth rate of 3.9% (Allied Market Research 2023)
- Asia-Pacific region dominates the market with almost 70% market share



Performance Testing Standards

Performance tests	If IEC 63437 is available	References before the final version of IEC 63437 is available
Test conditions (temperature and relative humidity)	IEC 62552-1: 2015, Annex A, Clause A.3.2. IEC 62552-1: 2015, Annex A, Clause A.3.6.	
Volume	IEC 62552-3: 2015, Annex H	
Maximum current		Latest draft IEC 63437 or Global LEAP Award Test Method
Empty pull-down		Latest draft IEC 63437 and Clause 6.3.5 of ISO 22044 (2021)
Beverage pull-down		Latest draft IEC 63437 or Global LEAP Award Test Method + Clause D.3 of IEC 62552-1: 2015, and IEC 62552-3:2015
Energy consumption (32C)	IEC 63437	Latest draft IEC 63437 or Global LEAP Award Test Method + Clause D3 of IEC 62552-1: 2015 (for unfrozen compartment) or Clauses 6.3.3.3 - 6.3.3.4 of IEC 62552-1: 2015 (for frozen compartment)
Storage temperature		Latest draft IEC 63437 or Global LEAP Award Test Method
Under- and over-voltage		Latest draft IEC 63437 or Global LEAP Award Test Method + Clause D3 of IEC 62552-1: 2015 (for unfrozen compartment) or Clauses 6.3.3.3 - 6.3.3.4 of IEC 62552-1: 2015 (for frozen compartment)
Autonomy		Latest draft IEC 63437 or Global LEAP Award Test Method + Clause D3 of IEC 62552-1: 2015 (for unfrozen compartment) or Clauses 6.3.3.3 - 6.3.3.4 of IEC 62552-1: 2015 (for frozen compartment)

Performance Requirements – Ceiling fans

- Minimum Air Flow Delivery and Energy Efficiency performance**

Blade Dimension ¹ (mm)	Min Air Flow Delivery (m ³ /min)	Service Value Level (m ³ /(min·W))
750 – 900	130	3.1
900 – 1,050	130	3.1
1,050 – 1,200	150	3.1
1,200 – 1,400	210	4.0
1,400 – 1,500	245	4.1
Greater than 1,500	270	4.3

¹ Blade dimension refers to the diameter of the circular area swept by the outer tips of the fan blades.

