

SOLAR-POWERED COLD CHAIN

Opportunities in the UN & International Organization Market

A commercial intelligence brief for manufacturers and suppliers evaluating entry or expansion in the global vaccine cold-chain market.

US\$144m

UNICEF cold-chain equipment procurement, 2025

8–10m L

Estimated storage gap through 2030 across 72 countries

~50%

Share of 17,543 UNICEF-supported CCE units in 2024 that were solar-powered

IPSC VIEW

The opportunity is real, but this is not a conventional refrigerator market. Commercial access is shaped by WHO/PQS qualification, UNICEF procurement channels, total-cost-of-ownership considerations and the ability to support installation, commissioning, training and maintenance.

Source: UNICEF Supply Annual Report 2025; UNICEF Global Annual Results Report 2024. Figures refer to broader cold-chain activity, not solar refrigeration alone.

Executive Takeaways

- ❖ Solar direct-drive refrigeration is now a mainstream solution for vaccine storage where electricity is absent or unreliable.
- ❖ UNICEF procured US\$144 million of cold-chain equipment in 2025, confirming a substantial institutional procurement base, although this is broader than the SDD market.
- ❖ UNICEF identified an 8–10 million litre storage gap through 2030 across 72 countries; about half of the 17,543 UNICEF-supported units installed in 2024 were solar-powered.
- ❖ Market access is gated: UNICEF procures WHO-prequalified equipment, while Gavi eligibility also applies additional performance criteria.
- ❖ Chinese suppliers are already represented, but competitiveness extends beyond hardware to installation, commissioning, training, maintenance and local service coverage.

Source: UNICEF Supply Division; WHO IMD-PQS; Gavi. Analysis by IPSC Global.

Market Landscape & Demand Drivers

Why solar direct drive matters. SDD systems use solar panels to power refrigeration directly and avoid the conventional battery architecture associated with earlier solar systems. UNICEF highlights their suitability for weak-grid settings and lower operating costs.

Demand driver	Commercial implication
Large remaining storage gap	Continued replacement and expansion needs across multiple country programmes.
Unreliable electricity	SDD remains relevant where grid-dependent equipment is unsuitable.
Resilience & sustainability	Procurement increasingly considers reliability, lifecycle cost, serviceability and environmental performance.

Evidence signals

- ❖ Supporting scale signals include US\$450 million invested through CCEOP during 2016–2025 and a 2024 South Sudan project that installed 222 solar refrigerators and 17 deep freezers.

IPSC interpretation

The strongest market proposition is not generic 'solar refrigeration'. It is reliable, prequalified **vaccine-storage infrastructure** for low-resource and hard-to-reach settings.

Source: UNICEF Supply Annual Report 2025; UNICEF Global Annual Results Report 2024; UNICEF South Sudan; WHO.

Buyer & Procurement Ecosystem

The market is best understood as an ecosystem rather than a single buyer. Funding, technical qualification, procurement and country implementation are often separated.

Layer	Key actors	Supplier focus
Financing / policy	Gavi, governments, development partners	Funding windows, country priorities, investment plans
Technical gate	WHO IMD-PQS	Specifications, testing protocols, prequalification
Procurement channel	UNICEF Supply Division	LTAs, product categories, price structures
Country implementation	Ministries of Health, UNICEF country offices, partners	Deployment plans, site conditions, logistics
Lifecycle delivery	Manufacturers, distributors, service partners	Installation, training, maintenance, spares

Procurement implications

- ❖ UNICEF procures WHO-prequalified equipment, commonly through LTAs with published FCA containerized price signals.
- ❖ Country delivery can include installation, functional testing, commissioning, training and maintenance; Gavi eligibility also applies performance criteria beyond minimum WHO/PQS qualification.

Source: UNICEF Cold Chain FAQ; UNICEF solar refrigeration price data; UNICEF service-bundle material; Gavi CCE Technology Guide.

Supplier Landscape & Price Signals

UNICEF's December 2025 price data shows a concentrated but multi-supplier market.

Category	Supplier	Model	PQS	Published LTA range*
<60L SDD refrigerator	Haier	HTC-110	E003/076	US\$1,950–2,650
<60L SDD refrigerator	Sure Chill	GVR 50 DC	E003/049	US\$2,450–3,345
60–120L SDD refrigerator	B Medical	TCW80SDD	E003/121	€5,209–6,651
<60L combined	Haier	HTCD-90	E003/074	US\$3,180–4,150
<60L combined	Dulas	VC60SDD-1	E003/084	€4,450–4,870
60–120L combined	Vestfrost	VLS 096A RF SDD	E003/132	€4,940–6,175

*FCA containerized prices from UNICEF's 2025 dataset; not normalized for currency, capacity, configuration or destination.

IPSC interpretation

Chinese manufacturers are already present.

Additional entrants need to differentiate on eligible product segments, lifecycle economics, reliability and service coverage rather than manufacturing cost alone.

Source: UNICEF Solar-powered Refrigeration Systems Price Data 2025; WHO IMD-PQS product catalogue.

Market Access: What It Takes to Compete

WHO/PQS is the central technical gate. WHO's E003 category covers refrigerators and freezers, including SDD technologies. Specifications and independent testing protocols address performance, freeze protection, solar systems and demanding climatic conditions.

Readiness area	Key question	Why it matters
Product eligibility	Is the exact model WHO/PQS prequalified or on a credible pathway?	UNICEF states it procures WHO-prequalified equipment.
Technical performance	Does it meet applicable E003 requirements?	Qualification is model- and specification-specific.
Commercial readiness	Can the company respond to LTA/tender requirements?	UNICEF publishes awarded price data.
Deployment capability	Can delivery, installation, commissioning and training be supported?	Service bundles matter in country implementation.
Lifecycle support	Are spares, warranty, technicians and maintenance credible?	Uptime is central to vaccine safety.

A practical entry sequence

- 1. Select the target segment and benchmark against existing PQS-qualified models.
- 2. Conduct a technical gap assessment against the applicable WHO/PQS specification and protocol.
- 3. Build a qualification plan before treating UN tender monitoring as a sales pipeline.
- 4. Map UNICEF/Gavi channels, LTAs and country demand signals.
- 5. Develop a service-partner strategy for target countries or regions.
- 6. Prepare commercial documentation, warranty/spares arrangements and tender-response capability.

Opportunity Outlook & Strategic White Space

Based on the evidence reviewed, IPSC sees four commercially relevant opportunity themes. These are analytical conclusions, not forecasts of specific future tenders.

Opportunity theme	Signal	IPSC assessment
Replacement & expansion	8–10m litre gap through 2030; ongoing modernization	HIGH — durable demand driver; qualification essential
Remote / weak-grid facilities	SDD suited to unreliable or absent electricity	HIGH — core use case with strong institutional fit
Service-enabled supply	Installation, commissioning, training, maintenance	MED-HIGH — differentiator with partner networks
Broader facility solarisation	Gavi is testing expansion to wider health-facility solarisation	EMERGING — adjacent opportunity beyond refrigerators

Where a new entrant should look

- Product categories where a new model offers a meaningful performance or lifecycle advantage.
- Countries with large cold-chain gaps, weak-grid conditions and active immunization investment.
- Partnership models combining competitive manufacturing with credible local installation and maintenance.
- Adjacent solar-health infrastructure opportunities where refrigeration can form part of a broader energy solution.

What not to assume

- A large UNICEF cold-chain procurement figure does not equal the addressable SDD market for one supplier.
- Low factory price alone will not overcome PQS, service or lifecycle requirements.
- UNGM registration by itself does not create eligibility for vaccine cold-chain procurement.

Source: UNICEF; WHO; Gavi. Opportunity ratings are IPSC Global analytical judgments based on public evidence reviewed as of September 2026.

IPSC Action Framework for Manufacturers

For a manufacturer evaluating this market, IPSC recommends a staged decision process. The objective is to avoid spending time on tenders before the company has established technical eligibility and a viable route to market.

Stage	Decision	Output	Go / No-Go test
1. Market fit	Which SDD segment matches our technology?	Segment & competitor map	Clear product-market fit
2. PQS readiness	What gaps exist against WHO/PQS?	Qualification roadmap	Technically feasible pathway
3. Commercial model	How will lifecycle value be positioned?	LTA/tender strategy	Competitive total proposition
4. Delivery model	Who installs, trains and maintains?	Partner model	Credible service coverage
5. Pipeline	Which buyers/countries matter?	Targeted intelligence watch	Actionable qualified pipeline

IPSC View- Bottom line

Solar-powered vaccine cold chain is a credible institutional market with sustained demand signals and established procurement architecture. The barrier is not lack of opportunity; it is the ability to become technically eligible, commercially competitive and operationally credible across the product lifecycle.

Selected primary sources

- UNICEF Supply Annual Report 2025 — www.unicef.org/supply/reports/unicef-supply-annual-report-2025
- UNICEF Solar-powered Refrigeration Systems Price Data — www.unicef.org/supply/documents/solar-powered-refrigeration-systems-price-data
- UNICEF Cold Chain FAQ — www.unicef.org/supply/cold-chain-faq
- WHO IMD-PQS E003 Refrigerators and Freezers — extranet.who.int/prequal/immunization-devices/e003-refrigerators-and-freezers
- Gavi Cold Chain Equipment roadmaps — www.gavi.org/our-work/market-shaping/roadmaps

Prepared by IPSC Global from publicly available institutional sources. Procurement values and price data should be interpreted within their stated categories and conditions. IPSC analytical judgments are distinguished from source-reported facts. This brief is for market intelligence purposes and is not a guarantee of procurement opportunity or award.

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