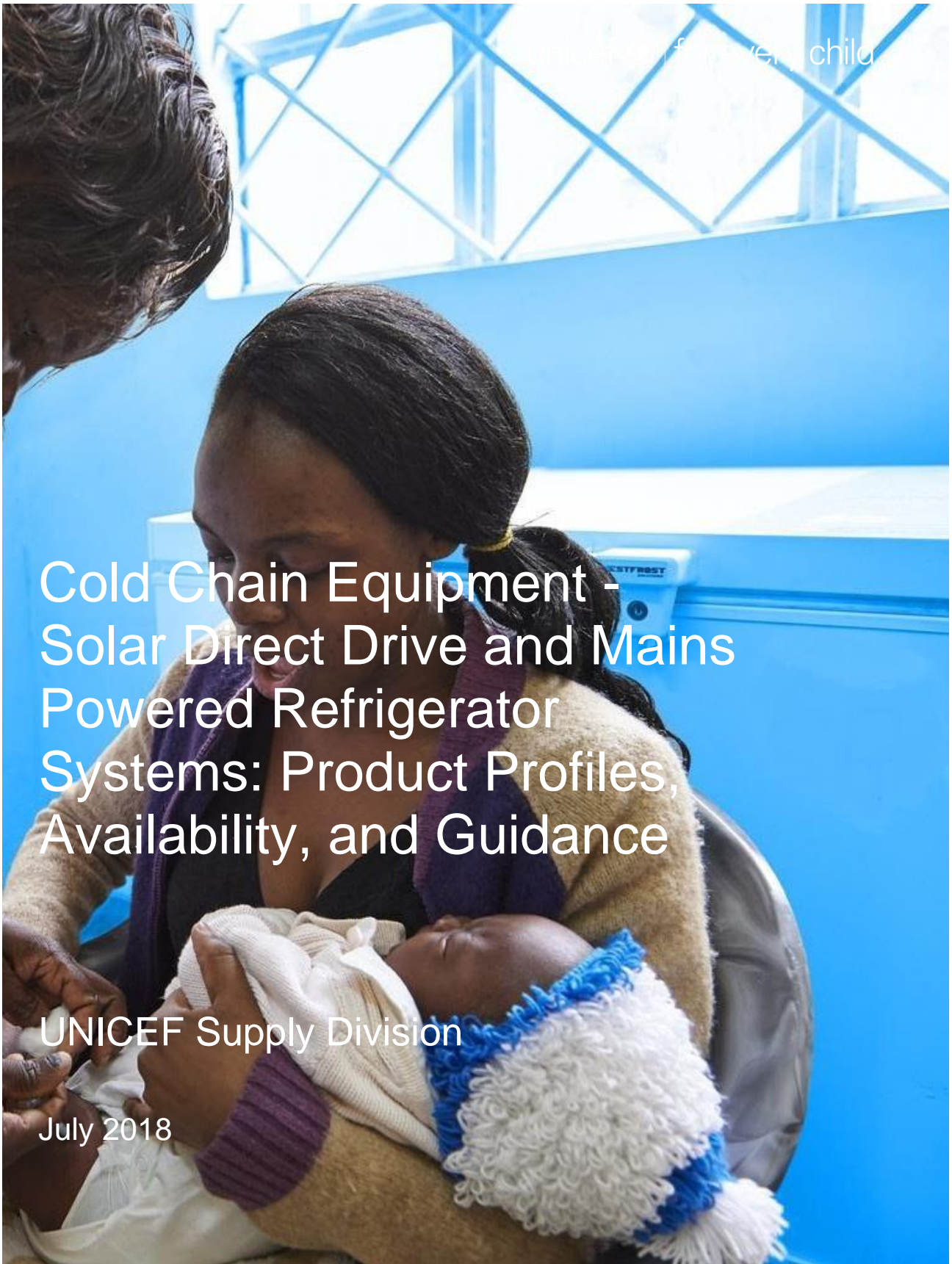


# Cold Chain Equipment - Solar Direct Drive and Mains Powered Refrigerator Systems: Product Profiles, Availability, and Guidance

UNICEF Supply Division

July 2018



## Cold Chain Equipment - Solar Direct Drive and Mains Powered Refrigerator Systems Product Profiles, Availability, and Guidance – July 2018

**This note provides revised supply and demand information on solar direct drive and mains powered cold chain refrigerators and freezers. From 2018, UNICEF includes procurement options for associated services for in-country delivery, installation, commissioning, and on-site training in usage and preventive maintenance.**

### 1. Summary

- UNICEF procures affordable cold chain equipment (CCE) prequalified by the World Health Organization (WHO) to improve immunization supply chain systems to manage and optimize vaccine delivery, storage, and safeguard vaccine potency. Promising new developments include higher performing technologies that offer user-independent freeze-free protection technologies and demonstrate performance at higher ambient temperatures.
- More than 80% of projected CCE requirements channelled through UNICEF is for immunization supply chain refrigerators and freezers. UNICEF, in partnership with Gavi, the Vaccine Alliance (Gavi), seeks to modernize and optimize supply chains and support countries scale-up access to higher-performing CCE to meet increased cold chain capacity requirements for new vaccine introductions and associated immunization activities.
- Gavi's investment in immunization supply chains, and CCE in particular, has strengthened and improved country demand forecasts, providing suppliers increased visibility on country requirements. As a result, it enabled UNICEF to secure improved commercial terms, product innovation, and more sustainable supply.
- UNICEF procures the CCE for Gavi's Cold Chain Equipment Optimization Platform (CCEOP). Under Gavi's CCEOP, CCE manufacturers provide in-country equipment distribution, installation, and commissioning, as well as on-site equipment training in use and preventive maintenance. UNICEF procures these in-country services from CCE suppliers and bundles the offerings together with the equipment.
- UNICEF launched a new CCE tender in 2017 for 2017-2019 to secure supply of higher-performing, cost-effective, and quality CCE products; to minimise product and services costs; as well as promote the availability of innovative pipeline products during 2017 and beyond. Following the tender, UNICEF awarded seven long-term arrangements (LTAs) to eight manufacturers for a 24-month period to supply SDDs and mains powered refrigerators. One LTA is shared between two manufacturers. UNICEF's LTAs can be extended up to 36 months if no significant changes in supply or demand occur. UNICEF will evaluate the market after 18 months to assess whether to extend LTAs or issue a new tender.
- UNICEF issued a separate service bundle tender in 2017 for in-country delivery, installation, commissioning, and on-site training. Five out seven manufacturers had the capacity and interest to undertake such operations. However, the tender showed that a global service bundle LTA was not feasible due to the variations of in country conditions. Rather, country specific contracting will determine country specific service bundle requirements. As of June 2018, UNICEF awarded 14 country specific contracts and is processing a further nine.

### 2. Background & Recent History

Launched in 1974 by the World Health Assembly (WHA), the expanded programme on immunization (EPI) seeks to ensure all children, in all countries, benefit from life-saving vaccines.

Global immunization programmes are one of the most successful and cost-effective health interventions known to date. Immunization programmes depend on fully functional and efficient national cold chain systems to deliver and store vaccines properly and effectively. Effective cold chain systems require efficient end-to-end vaccine storage, handling, and stock management to maintain vaccines under strict temperature control of between 2°C and 8°C (for almost all vaccines). A wide range of technologies such as cold and freezer rooms, refrigerators, freezers, cold boxes, vaccine carriers, icepacks, temperature monitoring equipment, accessories, spare parts and maintenance are required to ensure a fully functional cold chain system. This note will mainly focus on solar direct drive (SDDs) and mains powered refrigerators. UNICEF will describe temperature-monitoring and other technologies in separate notes.

Despite a six-fold increase in spending on vaccines to fully immunize children and a global target population size that has doubled, CCE and immunization systems have not benefitted from commensurate levels of funding, investment, or interest. National cold chain inventories in many locations are ageing, underperforming, or are no longer considered optimal. Designed in the 1980’s, they are straining to cope effectively with the recent surge in storage capacity requirements to reach populations that have yet to access immunization services (Table 1).<sup>1</sup>

Table 1 Changes and Developments to Global Immunization Programmes Since the 1980s<sup>2</sup>

Consideration	Description
Immunization programmes protect against 2 ½ times as many diseases.	The initial six standard EPI vaccines included <a href="#">diphtheria / tetanus / pertussis (DTP)</a> , <a href="#">measles</a> , <a href="#">polio</a> , and <a href="#">tuberculosis</a> . From 2010, depending on the country programme, EPI can include <a href="#">pneumococcal conjugate</a> , <a href="#">rotavirus</a> , hepatitis B, <i>haemophilus influenzae</i> Type B, <a href="#">yellow fever</a> , <a href="#">rubella</a> , <a href="#">Japanese encephalitis</a> , and <a href="#">meningococcal meningitis A</a> vaccines.
Age range coverage increased from infants to include adults.	Initially vaccines focused on infants and women of reproductive age. Currently, vaccines are recommended for infants, children (e.g. measles), adolescents (e.g. <a href="#">human papillomavirus</a> ), and adults (e.g. meningococcal meningitis A and <a href="#">tetanus / diphtheria (Td)</a> ).
Up to three times as many doses per person administered.	Initially, the EPI comprised one dose tuberculosis (Bacillus Calmette-Guerin), three doses DTP, polio, and one of measles. Since 2010, depending on the country programme, the total number increased in accordance with WHO published immunization position papers and vaccine recommendations.
Cold chain storage and transport up to four times more vaccine volume per fully immunized person.	Based on comparing the 2001 procured volumes for traditional vaccines against the projected volumes by 2020 per an anticipated fully immunized child in twenty country introduction plans, where <a href="#">pentavalent</a> , pneumococcal conjugate, rubella, and human papillomavirus vaccines drove growth, in addition to the surge capacity requirements for mass campaigns.

Source: World Health Organization

In 2015, Gavi assessed that up to 90% of health facilities in some countries are equipped with old, obsolete, or broken refrigerators with high freezing or temperature excursion risks, or, not equipped with any temperature monitoring device at all. Countries face multiple challenges in developing strategies to update existing cold chain systems and introduce new technology (Table 2). As a result, country choices are often not optimally informed, and as suppliers lack visibility on demand, any production planning is complex, which results in CCE costs being higher than they could otherwise be with improved market conditions and longer-term planning.

<sup>1</sup> World Health Organization, [National Programmes and Systems](#), WHO, Geneva, 2017.

<sup>2</sup> World Health Organization, [Immunization Supply Chain and Logistics: A Neglected but Essential System for National Immunization Programmes](#), WHO, Geneva, March 2014, p. 6.

Table 2 Some Key Country Challenges for Cold Chain System Optimization

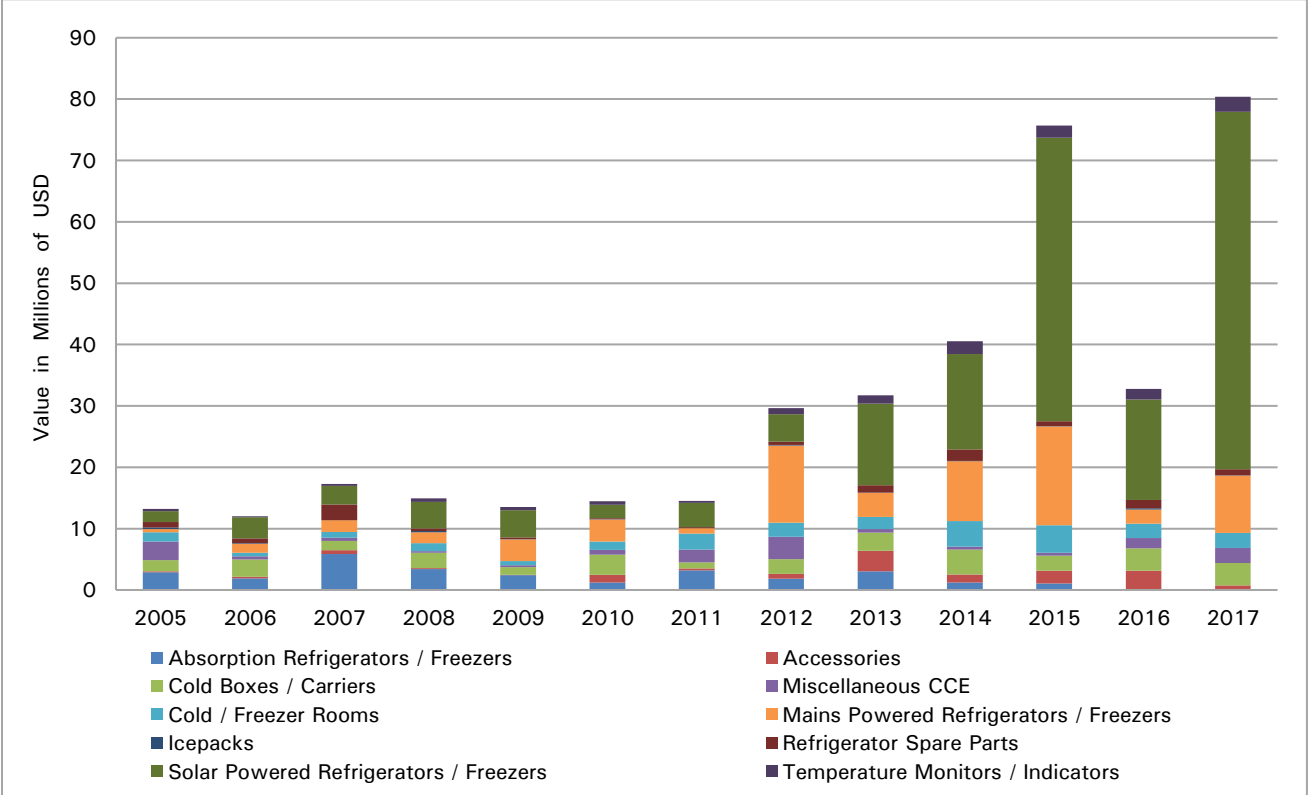
Consideration	Challenge
Funding	CCE funding is often insufficient or not sufficiently budgeted to meet a country’s full scope of needs.
Total cost of ownership	Some countries have difficulty to purchase new higher performing CCE technologies, as up-front capital investments costs can be higher than old technologies, despite lower estimated total cost of ownership. However, countries often do not have sufficient information to compare different device options, as well as their associated lifetime operating costs, durability, and sustainability in field conditions.
Markets	The CCE market has several shortcomings, notably limited demand visibility, fragmented supply, fragmented procurement, unclear pricing, and until recently, little incentives to adopt more appropriate innovative technologies.
Communication	The information exchange and communication between suppliers, procurement agents, and countries are not sufficient to inform countries on the best product choices.

Source: UNICEF Supply Division

3. Current Market Situation

3.1 UNICEF Engagement in the Cold Chain Equipment Market

Figure 1 UNICEF Cold Chain Equipment Procurement in USD from 2005-2017



Source: UNICEF Supply Division

WHO’s performance, quality, and safety (PQS) standards set the minimum performance requirements for CCE products procured by the United Nations (UN). UNICEF only procures products that are WHO prequalified and listed in [WHO’s PQS catalogue](#).<sup>3</sup> UNICEF also only

<sup>3</sup> World Health Organization, [PQS Catalogue](#), WHO, Geneva, June 2018.



procures WHO prequalified [vaccines](#) and [safe injection equipment \(SIE\)](#) in addition to CCE equipment in support of global immunization activities<sup>4</sup>. UNICEF provides partners and countries the commercial and technical information on CCE through its cold chain support package (CCSP), in addition to other technical guidance documents. The CCSP provides information and guidance to assist countries select and plan CCE product and service procurement in modular form, accessible [here](#).<sup>5</sup>

UNICEF CCE procurement until 2011 averaged USD 15 million a year (Figure 1). The procurement increased from 2012 after the prequalification and market entry of several innovative solar-powered refrigerators, and Gavi's Health Systems Strengthening (HSS) funding to support countries invest in cold chain systems. Following a review of Gavi's HSS funding in 2009, Gavi explicitly advised countries to review their immunization systems and invest in areas that hindered the scale-up of vaccine introductions and CCE procurement. Procurement increased in 2015 to reach USD 75 million, in large part because of a large project in the Democratic Republic of the Congo (DRC) that saw an almost nationwide CCE upgrade. In 2016, Gavi launched the CCEOP as a further funding opportunity and programme incentive requiring government joint investment, for countries to procure technologies that optimize vaccine delivery, storage, and safeguard vaccine potency,<sup>6</sup> as well as addressing market challenges (for more details on the CCEOP, see further below). Consequently, countries held back investments in 2016, which accelerated in 2017, and continues in 2018, while UNICEF implements the CCEOP.

Reported shortcomings identified in many product field performances, notably issues related to vaccine freezing and the effects of high ambient temperatures on refrigerators, led to the demand for higher performing equipment and accelerated product innovation. In 2014, WHO PQS published several target product profiles (TPPs) for refrigerators.<sup>7</sup> TPPs define the desired product characteristics and detail important considerations covering their intended use. The TPPs for CCE refrigerators called for important features to include user-independent freeze-free protection technology, and extend operating temperature ranges from 10°C to 43°C, as well as the use of temperature loggers, which are now all set as minimum requirements.

### **3.2 The Gavi Cold Chain Equipment Optimization Platform**

Gavi's 2016-2020 strategy seeks to ensure an additional 300 million children are immunized with lifesaving vaccines. Not only are immunization programmes expanding to reach unimmunized populations, they must also accommodate new and bulkier vaccines. One of the most promising developments includes the availability of user-independent freeze-free technologies and products that have demonstrated performance at high ambient temperatures.

Through the CCEOP, Gavi seeks to support up to a total of 90,000 health facilities in modernizing and upgrading their existing CCE, as well as equip a further 45,000 facilities with new equipment, extending cold chain coverage geographically with the most appropriate technology. Currently, for countries to be eligible for support to procure solar and mains powered refrigerators under the CCEOP, CCE suppliers must be responsible for in-country refrigerator delivery, installation, commissioning, and the training of health facility personnel.

Gavi has committed an initial USD 250 million through the CCEOP for approved technology procurement and delivery, installation, commissioning, and training, which requires country joint

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<sup>4</sup> UNICEF, [Safe Injection Equipment \(SIE\) Market Update](#), UNICEF, Copenhagen, April 2016.

<sup>5</sup> UNICEF, [Cold Chain Support Package](#), UNICEF, Copenhagen, March 2015.

<sup>6</sup> Gavi, the Vaccine Alliance, [Cold Chain Equipment Optimization Platform: The Technology Guide](#), Gavi, Geneva, February 2016.

<sup>7</sup> World Health Organization, [PQS Catalogue, Prequalified Devices and Equipment, Product List, Category Documentation](#), WHO, Geneva, 2017.

investment. As most country demand will likely be driven by refrigerator procurement, UNICEF and Gavi developed a roadmap and procurement strategy to influence the CCE market through four strategic objectives (Table 3).

**Table 3 Gavi’s Cold Chain Equipment Optimization Platform**

To balance supply and demand by increasing demand visibility with more accurate country demand forecasts, as well as stimulating demand to accelerate deployment of improved technologies through technical assistance.
To minimize costs using appropriate procurement mechanisms to reduce the transaction costs for suppliers, total cost of ownership, and recurring operational costs to countries through an improved mix of technology. A higher demand, and pooled procurement, could enable price reductions over time.
To incentivize suppliers to develop and commercialize new affordable innovative technologies, enabling them to have appropriate and innovative products through more predictable funding and procurement, and off-setting higher upfront costs for countries.
To improve information, knowledge, and management in countries through technical assistance, which will increase product choice visibility, performance, and costs, by facilitating manufacturer investment decisions to scale up production. More reliable demand forecasts and supporting strong feedback loop will improve the flow of CCE performance information to inform next generation CCE requirements.

Source: Gavi CCEOP Technology Guide

Gavi’s CCEOP has had a catalytic effect on the CCE market, visible by the growth in commercialized cold chain technology research and development (R&D) solutions listed on WHO PQS’ catalogue. UNICEF outlines a summary of available technology and considerations below (Table 4). More information on how to select equipment for funding under the CCEOP can be found in [Gavi’s CCEOP Technology Guide](#).<sup>8</sup> Note that absorption and solar battery refrigerators are not eligible for CCEOP.

**Table 4 Gavi Cold Chain Equipment Optimization Platform Product Descriptions**

Segment	Technology	Description
On-grid / Mains Powered	Mains powered refrigerators	Runs on power sourced from national grid or generator. Keeps vaccines cool and have long holdover times during periods of prolonged power loss (+2 days). Some refrigerators only require eight hours of power per 24 hours for effective vaccine storage. However, less power results in less holdover time.
	Mains powered freezers	Runs on power sourced from national grid or generator, with improved temperature control and reliability.
Off-grid	Solar direct drive (SDD) refrigerators and/or freezers	Runs on solar power technology void of batteries. Based on phase-change material (PCM); water-lined; ice-lined or ice-bank technology. Solar panels mounted on the roof of a facility considered standard. Alternate forms of installation available on request.
	Long-term passive devices	Keeps vaccines in cold storage for minimum one month with no power source (i.e. solar panels, batteries, grid, or other), using icepacks that requires re-freezing at regular interval.
	Cold boxes and vaccine carriers	Insulated containers used for transportation of vaccines between health facilities or storage points. Depend on coolant (water or ice packs to be re-chilled or refrozen after each use).
	Temperature monitoring devices	Devices to measure and record CCE temperature and display data to alert the user on instances of temperature excursions into unacceptable temperature ranges. Some devices can transmit SMS-based alarms on excursions or upload data to a logistics management information system.

Source: Gavi CCEOP Technology Guide

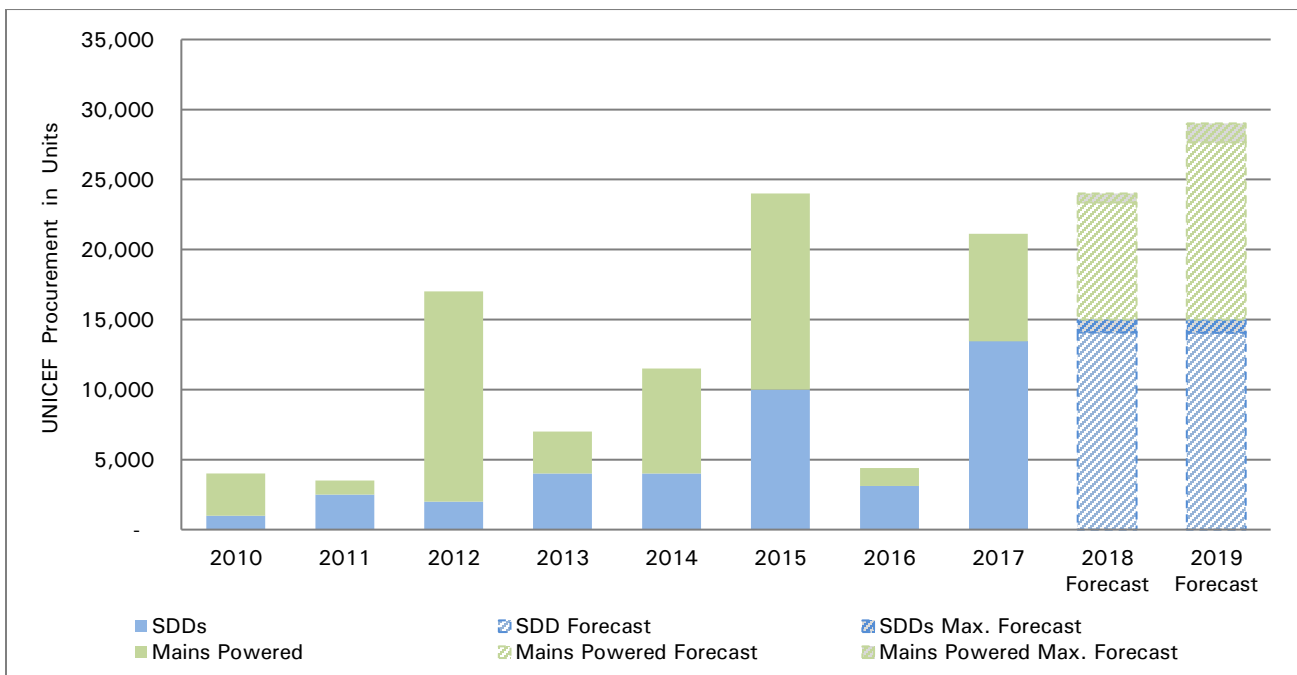
<sup>8</sup> Gavi, [Cold Chain Equipment Optimisation Platform: The Technology Guide](#).

### 3.3 Demand

Between 2010 and 2016, UNICEF procured more than 70,000 SDDs and mains powered refrigerator systems, averaging approximately 3,800 SDDs and 6,400 mains powered refrigerators per year, with annual quantities fluctuating significantly between 1,000 and up to 14,000 units per year. Under the current CCEOP funding envelope, UNICEF anticipates CCEOP-eligible country demand to reach between 100,000 and 110,000 units over 2017-2021. UNICEF procured approximately 22,000 units in 2017 and it expects to procure another 50,000 over 2018-2019 (Figure 2), depending on when demand from large countries materializes.

To date, UNICEF CCE procurement supports both Gavi-eligible and self-financing countries equally. Following the significant amount of funding availability through Gavi’s CCEOP, UNICEF anticipates that up to 80% of future refrigerator demand procured through UNICEF could come from Gavi-eligible countries, with a focus on better performing refrigerator technologies. In addition, the CCEOP will also contribute to, and develop, local commercial capacity for product delivery, installation, commissioning, and training.

**Figure 2 UNICEF Solar Direct Drive and Mains Powered Refrigerator Product Procurement 2010-2017 and 2018-2019 Forecast**



Source: UNICEF Supply Division

### 3.4 Supply

The refrigerators and freezers available through UNICEF fall into two categories: mains powered and SDD freezers and refrigerators. UNICEF categorizes products per bands of capacity volume. Different suppliers have models available in most bands, with each model’s product specifications detailed in WHO PQS product information sheets.<sup>9</sup> In support of Gavi’s CCEOP partnership, UNICEF developed a list of products, and associated service delivery, installation, commissioning, and training, for funding through the CCEOP (Table 5).

<sup>9</sup> WHO, [PQS Catalogue](#).

**Table 5 UNICEF Solar and Mains Powered Refrigerator Categories**

Type and Capacity	Mains Powered Available	Mains Powered Pipeline	SDDs Available	SDDs Pipeline
Freezer < 30l				
Freezer 30-60l			●	
Freezer 60-90l			●	
Freezer 90-120l	●			
Freezer > 120l	●			
Refrigerator < 30l	●		●	
Refrigerator 30-60l	●		●	
Refrigerator 60-90l	●		●	
Refrigerator 90-120l	●		●	
Refrigerator > 120l	●		●	
Refrigerator/freezer combination < 30l			●	
Refrigerator/freezer combination 30-60l	●		●	
Refrigerator/freezer combination 60-90l	●		●	
Refrigerator/freezer combination 90-120l			●	
Refrigerator/freezer combination > 120l		●		●

Source: UNICEF Supply Division

Additional information on mains powered compression refrigerators/freezers, SDD refrigerators/freezers, and associated service delivery, installation, commissioning and training, and product considerations are summarised below (Table 6 and Table 7).

**Table 6 WHO Prequalified Solar and Mains Powered Refrigerators - May 2018**

Mains Powered	SDDs
<ul style="list-style-type: none"> <li>Seven suppliers have thirty-six different WHO prequalified products.</li> </ul>	<ul style="list-style-type: none"> <li>Seven suppliers have thirty-five different WHO prequalified products, and four different technology solutions.</li> </ul>
<ul style="list-style-type: none"> <li>Twenty-eight products classified Grade A with user independent freeze-free technology. If a device is Grade A it means no user interference is required to prevent vaccine from freezing.</li> </ul>	<ul style="list-style-type: none"> <li>Thirty-five products classified Grade A with user independent freeze-free technology.</li> </ul>
<ul style="list-style-type: none"> <li>The different storage, cooling / freezing combination capacity can be a challenge when comparing the different models.</li> <li>The CCEOP has encouraged market to meet the platform eligibility criteria including freeze-free and extended ambient temperature.</li> </ul>	<ul style="list-style-type: none"> <li>Five new products launched in 2018, with a strong pipeline of new products meeting Gavi CCEOP requirements.</li> <li>Suppliers started introducing extended warranties on SDD products.</li> <li>The CCEOP has encouraged market to meet the platform eligibility criteria including freeze-free and extended ambient temperature.</li> </ul>
<ul style="list-style-type: none"> <li>Prices range from USD 380-5,000, depending on capacity, technology, and design.</li> <li>UNICEF considers the market relatively healthy, with increasing competition, and opportunities to introduce better performing technologies.</li> </ul>	<ul style="list-style-type: none"> <li>Prices range from USD 1,690-10,740, per capacity, technology, and design.</li> <li>UNICEF considers the market healthy, with increasing competition, and opportunities to introduce better performing technologies.</li> </ul>

Source: UNICEF Supply Division

**Table 7 Solar Direct Drive and Mains Powered Product Considerations<sup>10</sup> – Continued overleaf**

Product Description
<p><b>SDDs</b></p> <ul style="list-style-type: none"> <li>- SDDs are compression-cycle refrigerators, freezers or combined refrigerator/freezers directly driven by solar array. They are new-generation solar-powered refrigeration systems that do not require a battery and charge controller.</li> </ul>

<sup>10</sup> World Health Organization, [POS Devices Catalogue Prequalified Equipment for the Expanded Programme on Immunization](#), WHO, Geneva, p. 27.



- They are for use in rural areas where no grid-electricity is available and sunlight is abundant;
- Product sub-categories are segmented into those that use an ancillary battery to operate a fan, and those without.
- SDD systems use energy produced by solar array to directly refrigerate the vaccine compartment using different technologies such as:
  - Phase Change Material (PCM);
  - Ice-lined;
  - Water-lined;
  - Ice bank.
- SDDs are further classified into:
  - SDD refrigerators, i.e. with freeze-free technology;
  - SDD with combined refrigerators / freezers;
  - SDD freezers.
- UNICEF advises countries to conduct solar site evaluations before ordering equipment, as sufficient sunlight is required for the efficient and effective operation of equipment. Solar modules must be safely secured to counter the growing risk of theft.
- It is essential to ensure that a qualified service network exists to make on site assessments, installation, and provide long-term system maintenance.

#### **Mains Powered**

- Mains powered refrigerators are compression refrigerators that use alternating current (AC) electricity from the grid or a generator.
- Most mains powered refrigerators can maintain temperatures below +8°C on as little as eight hours of electricity per 24-hour period. They are the best choice where there is at least eight hours electrical power a day.
- Internal compartments (using ice-, chilled, water-lined, or frozen icepacks) surrounding the vaccine storage compartment to ensure cooling during power cuts, and can keep vaccines cool for at least 20 hours during electricity supply failure. When the power returns, the lining is re-frozen or re-cooled.
- Some refrigerators can operate on less hours of power per day, they can provide over ten days of acceptable temperature control without electricity.
- Compared to SDDs, the advantage of mains powered refrigerators is that they are more affordable.
- All newly WHO prequalified compression refrigerators listed in the WHO PQS catalogue have freeze-free vaccine storage compartments, preventing vaccine losses. In addition, they have non-adjustable thermometers that eliminates accidental freezing due to improper adjustment.
- Mains powered refrigerators are categorized into:
  - Ice lined refrigerators;
  - Combined ice lined refrigerator / water pack freezer;
  - Two-mode vaccine refrigerator, or water pack freezer.
- UNICEF advises countries to ensure that a qualified service network is in place to make onsite assessments, installation and provide long-term system maintenance.

#### **Associated Service Delivery, Installation, Commissioning, and Training**

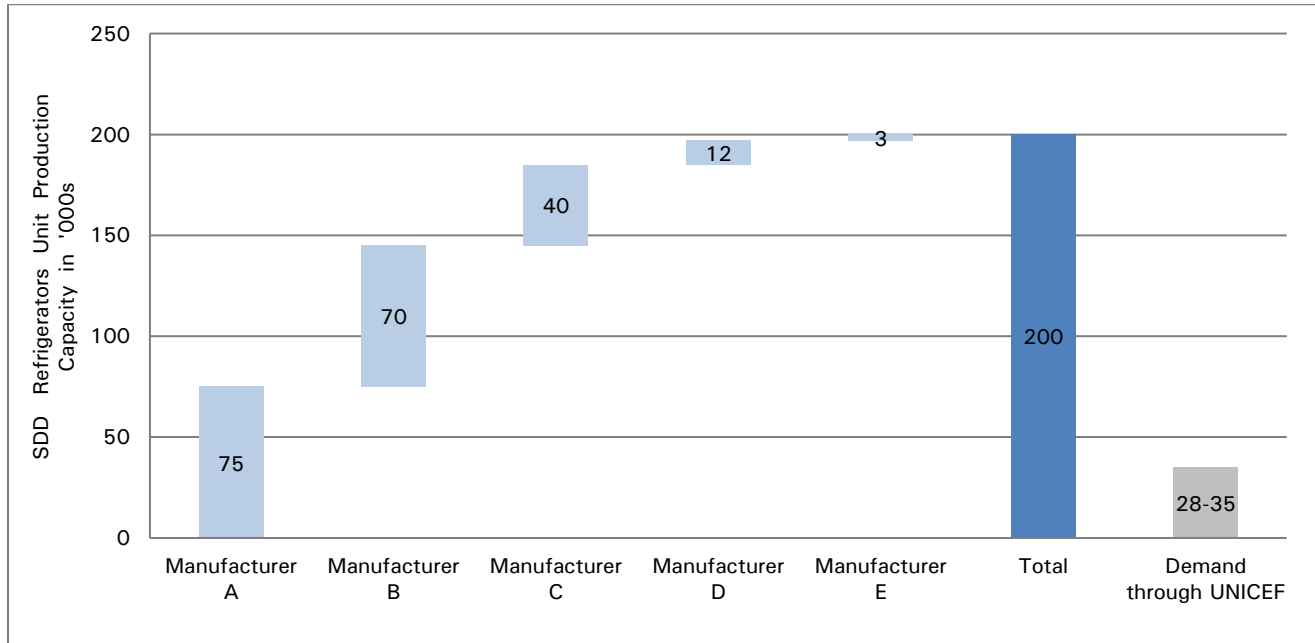
- Service delivery, installation, commissioning, and training, defined by Gavi as being mandatory for funding from the CCEOP encompass in-country CCE delivery, installation, commissioning, and basic healthcare worker training on the use and maintenance of equipment, and on warranty conditions. Additional training for technicians on maintenance can be requested.
- Under the CCEOP, the manufacturer of the CCE becomes accountable for the execution of three services:
  - **In country delivery** - consists of the delivery to service delivery point from port of entry of country (post custom clearance) for which it was ordered.
  - **In country installation** - consists of connecting the device's power inlets for on-grid systems, solar panel mounting for off-grid SDDs, and commissioning verification post installation (3-5 hours after installing mains powered systems and 1-3 days after installing SDDs).
  - **Healthcare worker training** - consists of training facility-based healthcare workers in routine CCE operation and preventive maintenance delivered to their facility for devices.
- The service delivery, installation, commissioning, and training excludes maintenance service contracts, which can be avoided with adequate and appropriate healthcare care worker training in preventive maintenance.

Source: UNICEF Supply Division

UNICEF launched a CCE tender during 2017 for new LTA awards to stimulate the demand and supply of higher-performing, cost-effective, and quality-assured vaccine refrigerators, and to promote the availability of innovative pipeline technology. Based on the tender outcome, UNICEF awarded seven LTAs to eight manufacturers of CCE for 24-month period to supply SDDs and

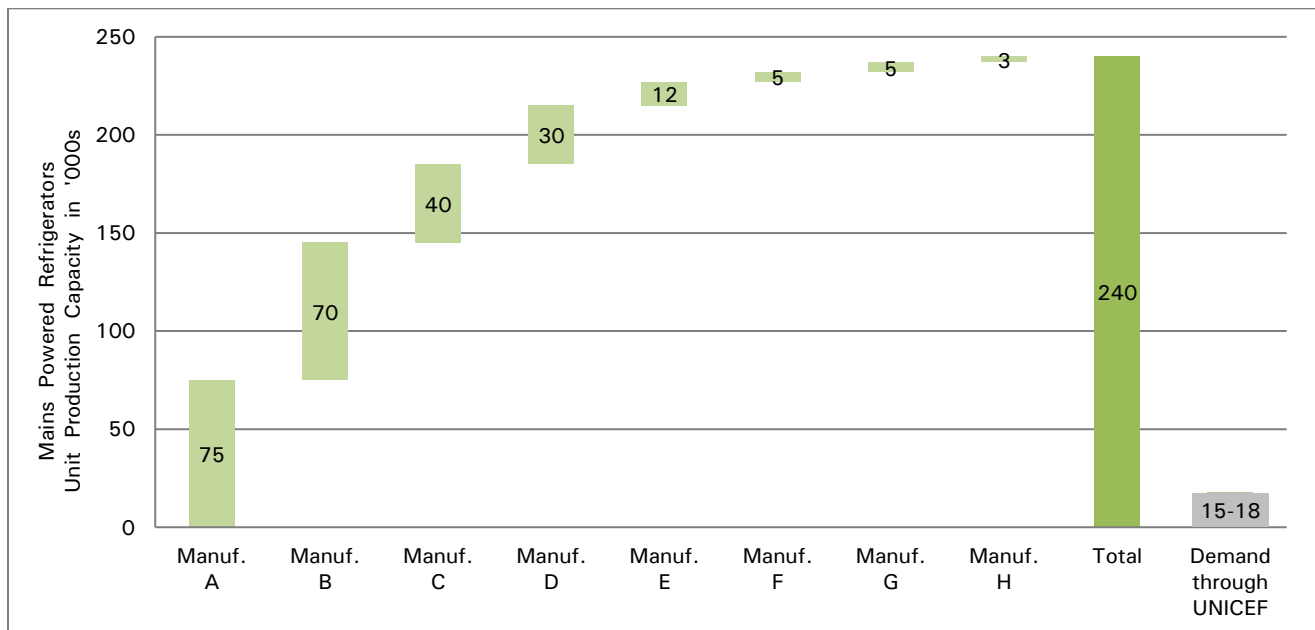
mains powered refrigerators. Note that one LTA is shared between two manufacturers. UNICEF will evaluate the market after the first 18 months to assess if there have been any significant changes in supply and demand before either extending LTAs to 36 months, or issuing a new tender. The production capacity of WHO prequalified SDD and mains powered refrigerator suppliers has substantially increased over last six years and can easily meet the demand (Figure 3-4).

**Figure 3 Solar Direct Drive Manufacturer Yearly Production Capacity vs UNICEF Demand**



Source: UNICEF Supply Division

**Figure 4 Mains Powered Refrigerator Manufacturer Yearly Production Capacity vs UNICEF Demand**



Source: UNICEF Supply Division

#### 4. Pricing

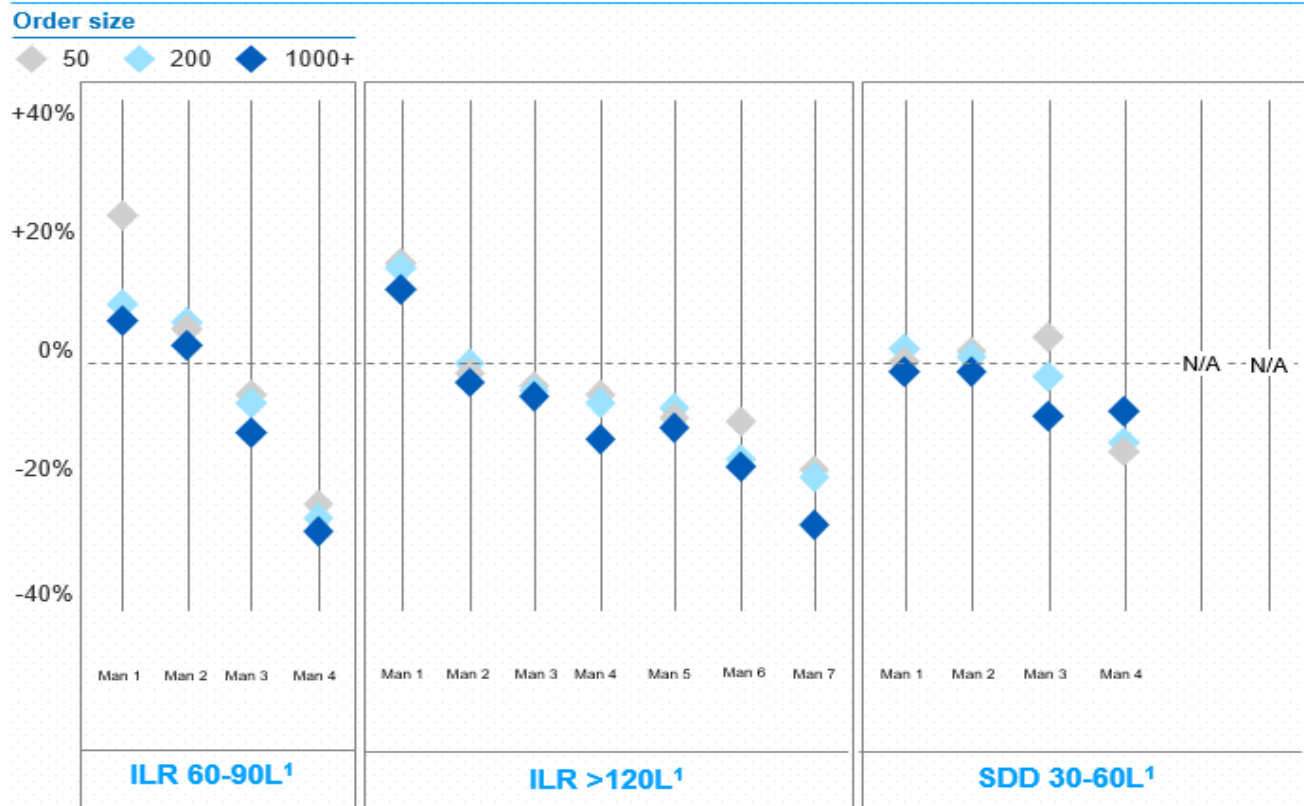
UNICEF publishes the historic, current, and future awarded prices for CCE, accessible [here](#).<sup>11</sup> The price ranges of SDDs and mains powered refrigerators vary widely per their capacity, technology platform, and design. SDDs start from USD 1,690 and can reach up to USD 10,740 and mains powered refrigerators start from USD 380 and can reach up to USD 4,900.

As part of the CCEOP’s launch, UNICEF anticipated price reductions and related savings following increased demand and improved forecasts. UNICEF’s analysis of price developments for devices with a high turnover following its tender in 2017 revealed that:

- On average, most manufacturers lowered their prices compared to earlier LTA prices, even when complying with new equipment requirements, e.g. the inclusion of remote temperature monitoring devices (RTMDs) for SDDs, or voltages regulators for mains powered refrigerators.
- Whereas established manufacturers maintained or even increased slightly their prices, new manufacturers substantially lowered their pricing (Figure 5).

Figure 5 2015 Tender and 2017 Tender Price Comparison in UNICEF Long-term Arrangements

**LTA prices, % change in price<sup>1,2,3</sup> (vs. pre-tender prices), top manufacturer product per category**



**Note 1:** Price comparisons show only products where historical prices are available for comparison.

**Note 2:** Price comparison assumes no order pooling across countries.

**Note 3:** Historical prices adjusted upward as required to reflect same product specifications as the CCEOP-compliant LTA bids (by adding USD 20.00 for temperature monitoring device; USD 30.00 for transportation costs, where historical prices were quoted ex-works; and USD 80.00 for ILR voltage regulators). Source: Global LTA prices for 2017 CCEOP tender (issued May 2017); WHO prequalified device catalogue (June 2017); and Solar Direct Drive LTA pricing (2015).

Source: UNICEF Supply Division

<sup>11</sup> UNICEF, [Cold Chain Price Data](#), UNICEF, Copenhagen, December 2017.

As such, potential savings depend on whether countries test products from manufacturers that are relatively new in the market and that have been recently WHO prequalified. UNICEF also notes a potential for price reductions for consolidated orders. UNICEF encourages countries to consolidate demand, as long as it does not compromise any programmatic objectives (e.g. speed of delivery) or counteract any healthy market objectives (e.g. promotes a monopoly). As the demand for the CCEOP develops, and UNICEF fine tunes its long-term demand forecasts, UNICEF expects to achieve further price reductions.

#### **5. Procurement of Services - Refrigerator Delivery, Installation, Commissioning, and Training**

A mandatory funding requirement via Gavi's CCEOP is a suppliers' responsibility for the delivery, installation, and commissioning of refrigerators at health facilities and training. The requirement seeks to harness the private sector's capacity to scale-up delivery and commissioning rapidly, while minimizing the risk of poor installations, which is one of the main reasons refrigerators remain out of service or use when delivered to the port of entry. Suppliers are also required to provide onsite training on the care and routine maintenance of equipment on the day of installation.

While UNICEF expects these interventions to have a positive impact on efforts to strengthen and scale up immunization supply chains, it does add a layer of complexity to procurement project planning and execution. Foremost, at the onset of procurement planning, countries must provide the detailed address and locations of health facilities that will require the equipment, including the contact information of delegated officials authorised to receive property on behalf of the government. Parties will have to identify and agree on contingency measures in advance to ensure all parties are informed on how to handle any deviations from an original deployment plan. A deployment plan's quality will be of primary importance, as governments will be responsible for any additional costs incurred as a result of deviations.

Country programmes used to only consider a product's "unit-cost" in procurement planning. However, UNICEF encourages governments to consider and assess total cost of ownership (TCO), which is the combined costs of product, service delivery, installation, commissioning, training, as well as the other complexities, including the implications of switching brands.

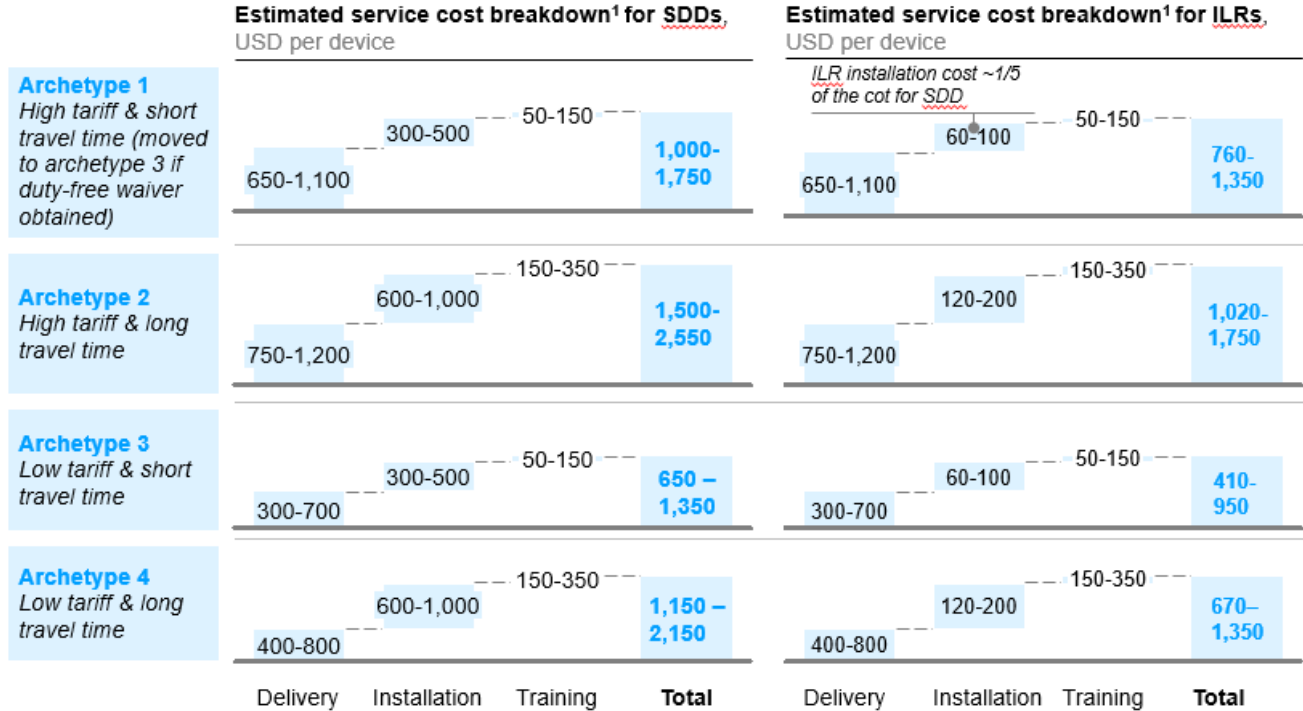
As the market is still relatively immature for these services, UNICEF issued a tender in 2017 to explore the market according to different supply scenarios. UNICEF's tender found that five out of the seven prequalified CCE manufacturers had the capacity, and interest, to undertake such expanded operations. UNICEF's tender further found that global service bundle LTAs would not be optimal due to the substantial variations in country conditions and how manufacturers perceived them.

UNICEF decided that country specific tenders would be preferable to determine the specific service bundle conditions. UNICEF can assess the offer of a country specific service bundle against different archetype assumptions applied in Gavi's CCEOP budget template (Figure 6).

As of June 2018, UNICEF has processed 17 country specific CCEOP service bundle offers. Consolidated country offers typically fall within the archetype assumptions applied in Gavi's CCEOP. However, individual offers and cost deviations vary substantially from the archetype assumptions. They reflect substantial variations in country conditions, including transport and security conditions, and distances, as well as a manufacturer's limited operating experience in some of these settings. Consequently, UNICEF developed a tool to measure business processes and performance metrics against industry best practices, as well as from other companies, to use to compare and take into consideration country specific variations related to distance,

transport, costs, tariffs, security, amongst others. The tool has helped stakeholders better understand specific market conditions and has proven effective in discussing and adjusting different cost structures.

Figure 6 Gavi’s Service Bundle Cost Ranges per Country Archetype



**Note 1:** Low tariffs are defined as <10% tariff for vaccine refrigerator; Assumed high tariffs for Korea DPR and Somalia due to lack of transparent tariff information; travel time is based on country size and quality of trade and transport-related infrastructure index. Source: Gavi (2014 World Bank transport logistic index; and 2014 International Trade Centre tariff index).

Source: UNICEF Supply Division

As UNICEF implements the service bundle concept in CCEOP-eligible countries, the role of country stakeholders will also change. Previously, equipment delivery and commissioning functions were the responsibility of a government body, or partner, that cleared the goods from customs, and held them at a warehouse until such time to install and commission. With suppliers now responsible for equipment delivery, installation, commissioning, and training, goods are delivered in country to an agreed distribution point by the supplier, and their local representatives take over delivery, installation, commissioning, and training. Government and implementing partners are now mostly responsible for project management and support.

As the service bundle concept is unfolding, the manufacturers provide more comprehensive service bundle offers. Such elaborations include monitoring of equipment performance, extended warranties, and after-sales services. The extended services would typically be offered with an add on price. As the offers evolve, it is critical that countries consider TCO arrangements, and further reflect on how product/service specific optimization match their general maintenance strategy and infrastructure.

**6. Issues / Challenges**

- Historically, CCE procurement has been fragmented, with demand forecasts being of limited value for supplier production and planning. Gavi’s CCEOP has strengthened and improved



country CCE demand forecasts, which provide suppliers increased visibility on country requirements. UNICEF expects this will lead to improved commercial terms and sustainable supply. After some initial delay, the implementation of the CCEOP has gained momentum. UNICEF expects the momentum of implementation to stabilize during 2018.

- The wide range of different CCE products, technology, systems, and limited price transparency on products and services, has been a challenge for countries when countries define their CCE and maintenance requirements and related budgets, including the CCEOP application context.
- Despite important efforts to highlight and promote the advantages of some new technologies through a product's TCO, there is still insufficient long-term evidence-based data to assess accurately a product's comparative advantages and cost efficiencies to encourage countries to invest in new and alternative CCE products. As such, stakeholders must document and share experiences of different issues and solutions as they roll out the CCEOP.
- The market for commercialized product delivery, installation, training, and after sales service in many developing countries is still under development. While manufacturers gradually develop their different business models, there is a need to determine how each specific model fits with broader existing systems of distribution and maintenance in different countries.
- Given so many elements of uncertainty, there may be possible rigidities in some country product/brand preferences that may inhibit the CCEOP's ability to leverage healthy market competition.

## **7. Steps Forward**

- UNICEF will continue to fast-track procurement eligibility as soon as products that meet the requirements become available to improve product accessibility for country programmes, and as part of existing conditional LTA awards for pipeline CCE.
- UNICEF will evaluate the CCE market at the end of 2018 to assess whether to extend LTAs, or issue a new tender.
- UNICEF expects to launch more than 20 country specific CCEOP tenders for service delivery, installation, commissioning, and training in 2018. To guide industry, UNICEF will continue to update its public tender calendar on a monthly basis with information gathered from partners and country offices. Similarly, UNICEF will update long-term forecasts on a quarterly basis.
- UNICEF, together with partners, will continue to reflect and work towards a healthy CCE market development, and update Gavi mains powered/SDD roadmap, which it schedules for release in Q3 2018.
- UNICEF will continue to collaborate with external partners to support the implementation of its joint strategy with Gavi to ensure an optimal operational impact. This will involve the current feasibility evaluation of different TPPs and service bundle components, which in turn will lead to adjustments in specifications for ongoing tenders.
- UNICEF, together with partners, will document and share programme implementation experiences, and update guidelines and facilitate sharing peer-to-peer experiences, with a focus on product performance and service bundle implementation.
- UNICEF will continue to collaborate with PATH, an international, non-profit global health organization focusing on product, service, and system innovation, on CCEOP's TCO tool, including the assessment of the different manufacturer service models.<sup>12</sup>

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<sup>12</sup> PATH, [Total Cost of Ownership Tool for Cold Chain Equipment](#), PATH, Seattle, April 2017.

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