POLITECNICO MILANO 1863

UN environment programme

Ministero dell'Ambiente e della Sicurezza Energetica

TECHNICAL PRESENTATION

EPIC Deploy

Five markets, one question

What stands in the way of reliable, sustainable cooling in healthcare, education and the food cold chain?

Three priority subsectors

Healthcare	Education	Food cold chain
clinical continuity	thermal safety	avoided losses

Brazil

Refrigerant leakage becomes the emissions hotspot

90%

renewable electricity generation

MAIN TECHNICAL POINT

Project value depends on low-GWP selection, leak-tight installation and end-of-life recovery, not only on kWh savings.

SPECIFIC CRITICALITIES

- Refrigerant leakage can dominate the footprint when electricity is low-carbon.
- Cooling access remains unequal: fewer than half of classrooms have mechanical cooling.
- Cold-chain load is concentrated in process refrigeration, especially meat and poultry.

PRIORITY INTERVENTION AREAS

Low-GWP	Leak control	Roof + shading	Life-cycle tender

Procurement implication	Evaluate the solution against the country-specific constraint, not against nominal equipment efficiency alone.

CRITICALITY

Low-carbon electricity shifts the climate burden to refrigerants.

Efficiency remains relevant, but the main avoidable footprint is leakage, recovery and refrigerant choice.

Ethiopia

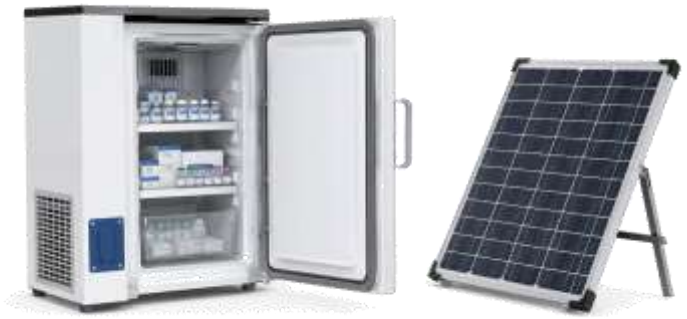
Supply constraints come before conventional efficiency gains

55%

national electricity access

MAIN TECHNICAL POINT

Cooling must be autonomous, maintainable and located where enough demand is aggregated to sustain the asset.



SPECIFIC CRITICALITIES

- About 60 million people remain without electricity despite a very clean grid.
- Hottest lowlands overlap with thinner grids, hospitals and school infrastructure.
- Horticultural post-harvest losses create a large avoided-emissions opportunity.

PRIORITY INTERVENTION AREAS

Autonomy	PV hybrids	Local service	Aggregation hubs

Procurement implication Evaluate the solution against the country-specific constraint, not against nominal equipment efficiency alone.

CRITICALITY

Clean power is not available where cooling is most needed.

The hottest lowlands overlap with thinner grids, health infrastructure and school coverage.

Kenya

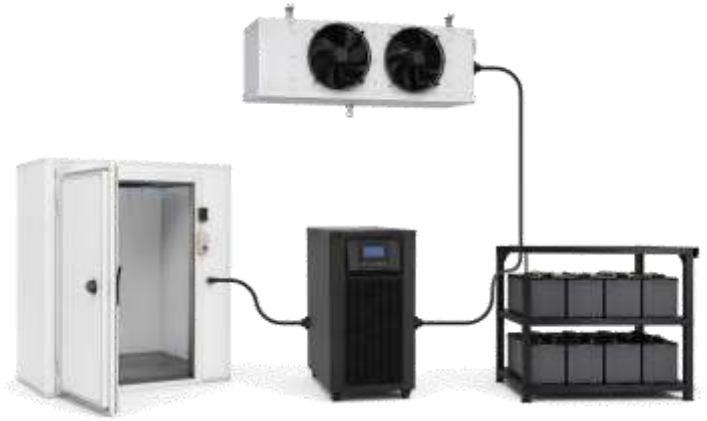
Clean generation does not guarantee reliable delivery

3.5

outages per month reported by firms

MAIN TECHNICAL POINT

The key technical value is ride-through: critical cooling loads must continue through outages, not only survive them.



SPECIFIC CRITICALITIES

- More than 90% renewable generation does not translate into fully reliable delivery.
- Around 30% of government health facilities lack reliable electricity.
- Fixed-speed AC, R22 legacy equipment, large classrooms and scarce technicians raise downtime risk.

CRITICALITY

Critical cooling loads must ride through outages.

Reliability is the decisive design constraint for health facilities, cold chain assets and schools.

PRIORITY INTERVENTION AREAS

Ride-through outages	Roof first	Low-GWP AC	Spares + skills

Procurement implication Evaluate the solution against the country-specific constraint, not against nominal equipment efficiency alone.

Morocco

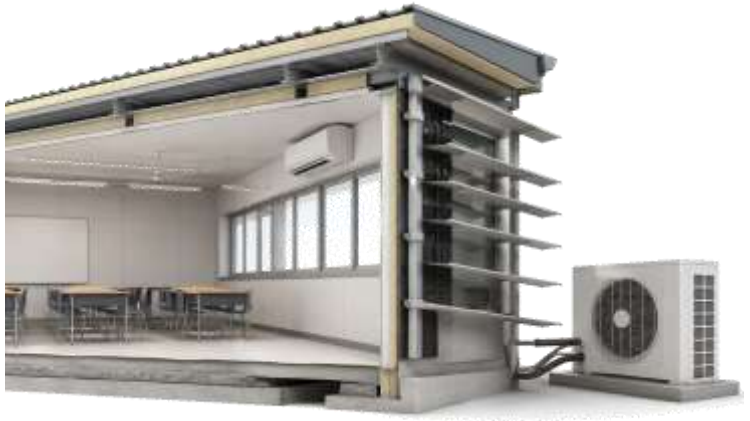
High grid carbon intensity and water scarcity shape options

0.83

kg CO2 per kWh grid factor

MAIN TECHNICAL POINT

Envelope and equipment should be procured as one package because avoided consumption carries high carbon value.



SPECIFIC CRITICALITIES

- Universal access removes the connection barrier, but grid carbon intensity is high.
- Thermal regulation mainly affects new construction, leaving existing stock as an open opportunity.
- Water scarcity makes evaporative cooling site-dependent, even where it is thermodynamically attractive.

CRITICALITY

Every avoided kWh has high carbon value, but water limits some options.

Envelope measures, climate-zone sizing and site water checks must be part of the technical package.

PRIORITY INTERVENTION AREAS

Envelope	Climate zones	Water budget	Efficient sizing

Procurement implication	Evaluate the solution against the country-specific constraint, not against nominal equipment efficiency alone.

Tunisia

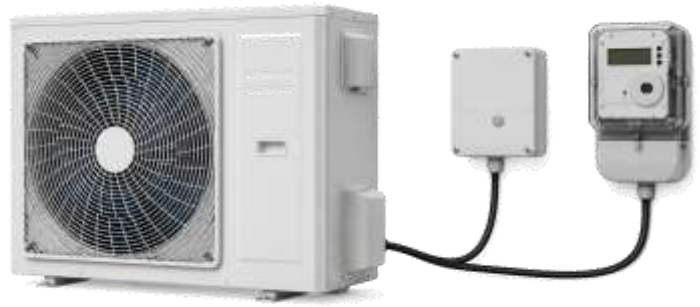
Cooling is concentrated at the gas-fired peak

44%

of record summer peak attributed to AC

MAIN TECHNICAL POINT

Efficiency is most valuable when it reduces peak demand, especially in hospitals and critical refrigeration.



SPECIFIC CRITICALITIES

- August electricity peaks can reach up to 4,500 MW, with AC responsible for a large share.
- Roughly 95% gas-fired generation makes peak cooling an energy-security and sustainability issue.
- About 98% of vaccine refrigerators were domestic appliances, not prequalified medical units.

PRIORITY INTERVENTION AREAS

Peak savings	Controls	Metering	Retrofits

Procurement implication	Evaluate the solution against the country-specific constraint, not against nominal equipment efficiency alone.

CRITICALITY

The most valuable kWh is the one saved at peak.

Peak cooling demand is tied to gas-fired generation, system stress and energy security exposure.

What travels across all five

Strong applications should turn screening insights into measured, site-level designs.

01

One integrated design

Efficient equipment, passive measures and on-site generation should be sized together, not procured as separate options.

02

The right emission target

Clean grids shift attention to refrigerants. Carbon-intensive grids make avoided kWh decisive. Reliability-led markets require ride-through.

03

Measured baselines

Screening identifies where to look. Final sizing needs operator-level data, measured baselines and current asset inventories.

SUBSECTOR TRANSLATION

Healthcare
aim for reliability and continuity

Education
passive removes heat before cooling

Food cold chain
avoided losses can count as mitigation

Thank you for your attention

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