

P H A S E - C H A N G E M A T E R I A L S

Cooling, made dispatchable

We are a thermal infrastructure materials company —
nano phase-change materials and conductive solid-state modules
that give AI data centers and mission-critical sites dispatchable thermal
capacity.

KILOTONNE CAPACITY

43 PUBLIC TDS

10+ COUNTRIES

A phase-change material company, made in Ningbo, serving the world

Kilotonne

PURE PCM CAPACITY /
YEAR

43

PUBLIC TECHNICAL
DATA SHEETS

10+

COUNTRIES & REGIONS

-80~300°C

CONFIGURABLE
PHASE-CHANGE RANGE

Material genome

Organic / inorganic / composite PCM library, nano-encapsulation and 3D conductive structures.

Quality system

RAL association member; PE-O-5 carries a product-level quality mark; ISO system in operation.

Engineering

Three-tier material-module-system validation, with cold plate / CDU / chiller / cold-storage interface experience.

R&D organization

Provincial New R&D Institution · Tech Innovation Center · 30%+ MS/PhD.



NINGBO · R&D HEADQUARTERS

Heat is becoming the constraint on infrastructure

100kW+

PER AI RACK TODAY
≈10× LEGACY DENSITY

~40%

OF FACILITY ENERGY
SPENT ON COOLING

3×

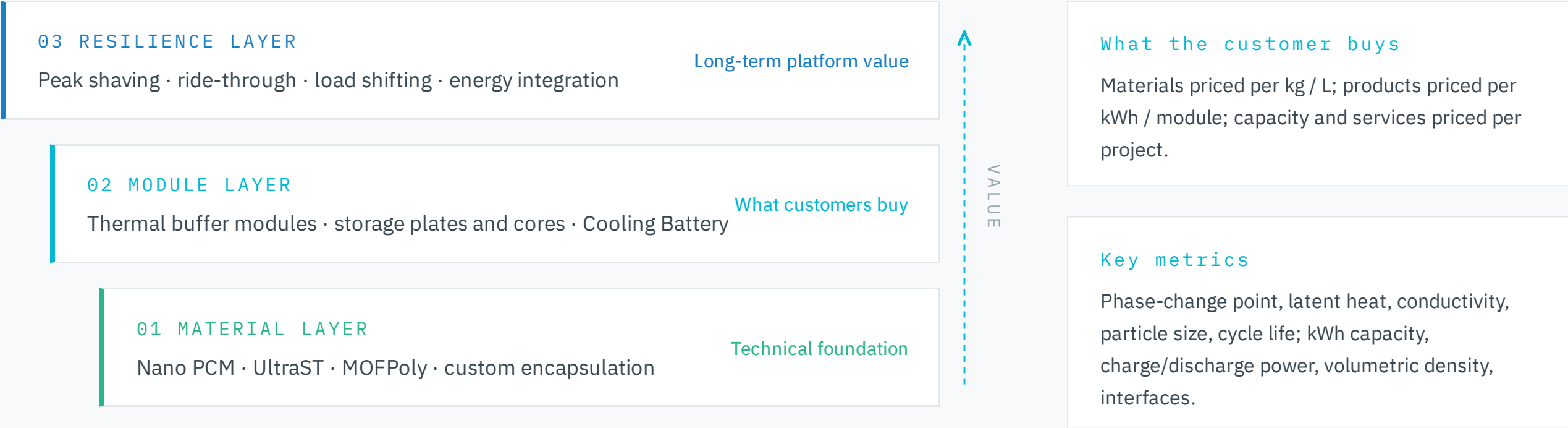
GLOBAL COOLING
DEMAND
GROWTH BY 2050 (BAU)

- Peaks: capacity is built for extremes, then runs at low utilization all year.
- Swings: load and tariffs move fast, but cooling cannot be stored or dispatched.
- Interruptions: when a chiller or the grid fails, temperature runs away within minutes.



HYPERSCALE AI DATA CENTERS

One material platform, three layers of value



Every building block can be bought on its own — or stacked into a complete thermal-capacity solution.

EDGE Material Inside

PASSIVE EDGE PROVIDES

- Formulations, phase-change ranges, shell chemistry
- Core modules and critical interface design
- Performance models, selection and thermal simulation
- TDS, quality standards and validation data

PARTNERS OWN

- Equipment design, enclosures and piping
- EPC, installation and long-term O&M
- Customer relationships, channels and project finance
- Local service and after-sales network

What it means for OEMs / integrators

Put our materials and modules into your BOM and your solution: the performance gain lands in your product, and the customer stays yours.

What it means for owners / end users

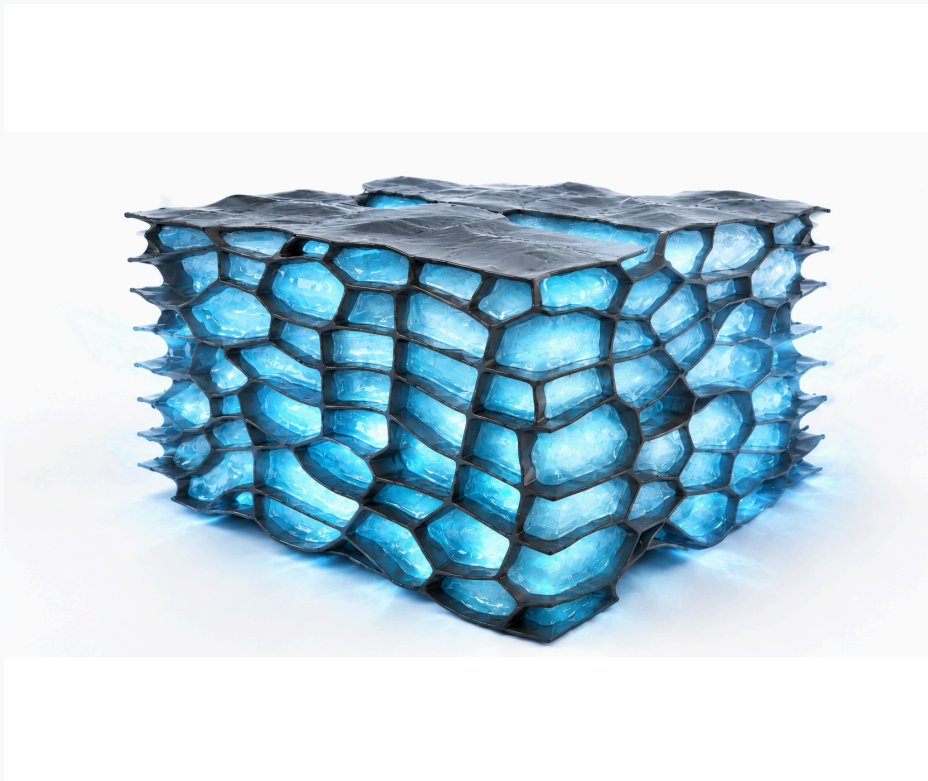
Buy through your existing vendors without changing systems; we supply the material warranty, test methods and M&V support.

What it means for channels

Region and account protection, joint development and minimum-purchase arrangements, secured by long-term supply agreements.

PLATFORM A • ULTRAST

UltraST conductive solid-state PCM



PCM held in the UltraST 3D graphite network (structural render)

- All-solid-state: no phase separation, no leakage risk
- Conductive 3D graphite network for far higher charge/discharge power
- ~3× the energy density of water-based storage
- Machinable into panels, blocks, cartridges and stacked cores

20 W/m·K

TYPICAL PEAK CONDUCTIVITY

7×

SMALLER VS CHILLED
WATER

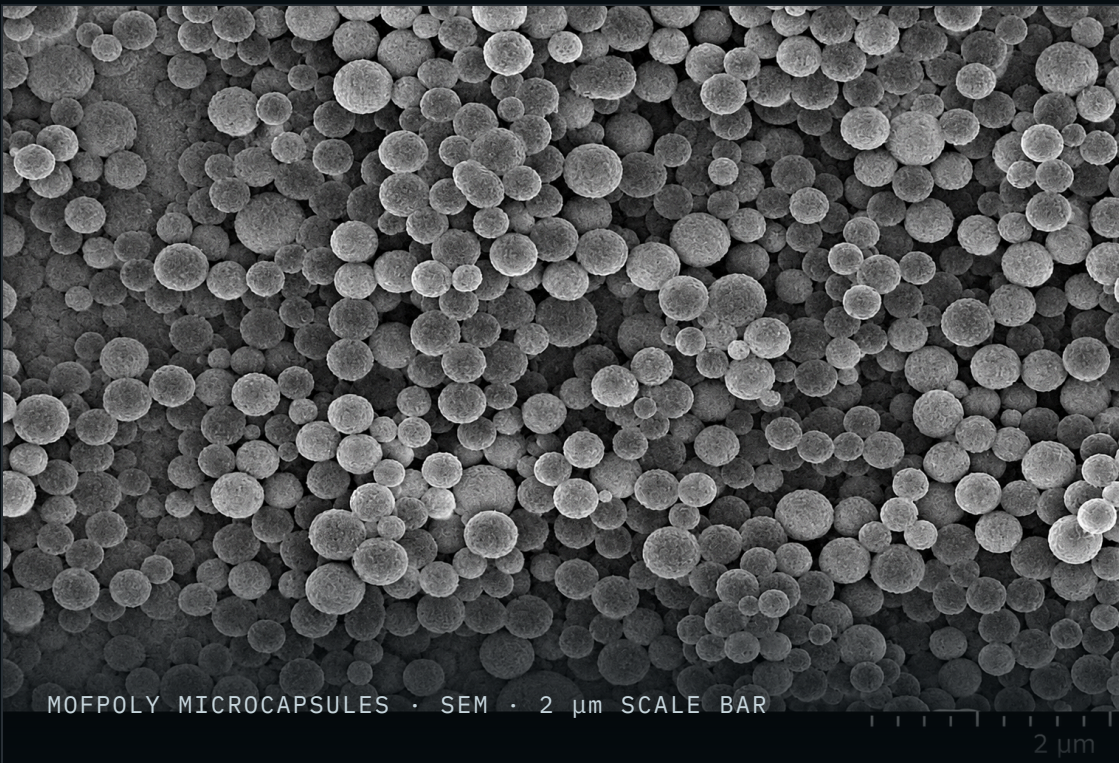
10k+

TARGET CYCLES

Typical use: rack/loop-level thermal buffering, facility storage cores, off-peak cold storage, industrial peak shaving.

PLATFORM B • MOFPOLY

MOFPoly nano-encapsulated PCM



- Sub-200nm capsules with controlled size distribution
- 180–220 J/g latent heat; shell withstands pump shear
- Continuous production line, millisecond coating
- Dispersible in coolants, paints, textiles and polymers

<200nm
CAPSULE SIZE

180–220
J/g LATENT HEAT

–16°C
AT THE CHIP (TEST
VALUE)

Typical use: liquid-cooling coolant enhancement, chip-level hotspot absorption, functional coatings and thermal textiles.

Data basis: material and engineering test values (Grade B evidence); customer-site conclusions are governed by third-party M&V reports.

–80°C to 300°C: a configurable temperature spectrum



Family	Phase-change range	Typical applications
Cryogenic / LNG	–80 to –20°C	LNG cold energy recovery, deep-cold logistics, vaccines and biosamples
Cold chain / storage	–25 to 8°C	Off-peak cold storage, reefer boxes, pharmaceutical cold chain
Electronics & compute	15 to 45°C	Edge cabinets, base stations, liquid-cooling loops, chip hotspots
Buildings & comfort	18 to 32°C	Building envelopes, district cooling, the Edge Comfort line
Industrial & high-temp	60 to 300°C	Waste-heat recovery, process peak shaving, steam and hot-water systems

Every grade ships with a TDS: phase-change point, latent heat, conductivity, density, cycling stability and compatibility notes.

The Cooling Battery

Tier 1	Tier 2	Tier 3
PCM Material	Thermal Module	Battery System
3D-graphite solid-state	Panels, blocks, cartridges	Containerized modular unit

- 01

Charge

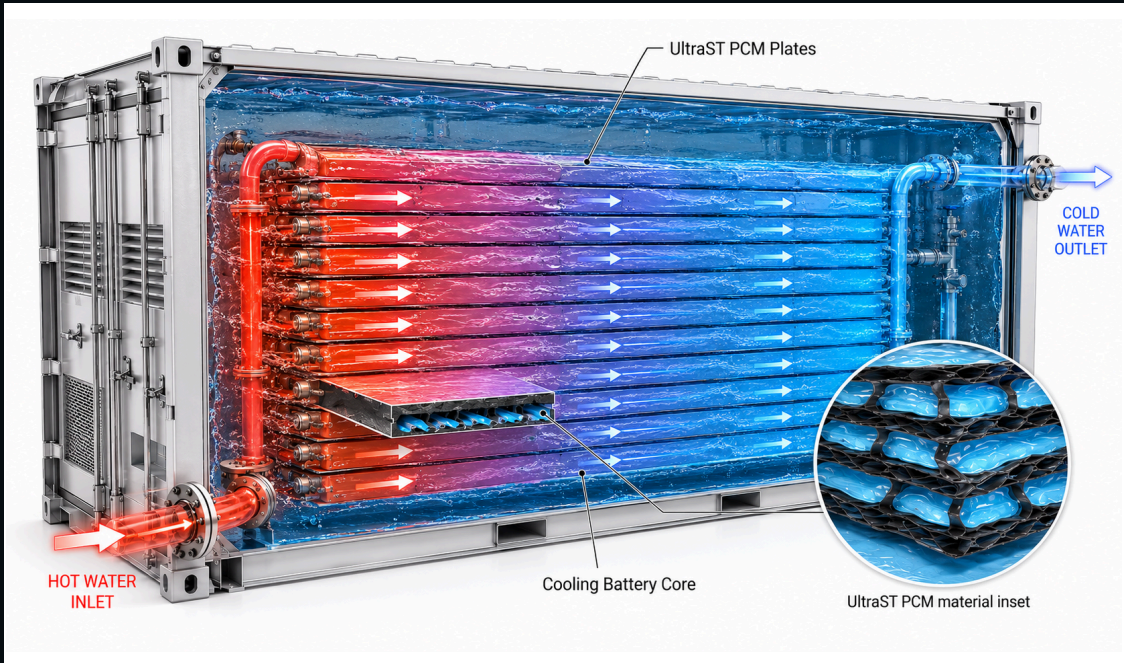
Store cooling off-peak — ambient air, LNG cold energy or low-tariff grid.
- 02

Store

Hold thermal energy with near-zero active power draw and stable cycles.
- 03

Release

Release on demand at peak or on failure — instant, no compressor start.



CONTAINERIZED COOLING BATTERY

Inside the containerized Cooling Battery: hot water inlet → UltraST PCM plate stack → cold water outlet; the core is PCM held in a 3D graphite network.

20-35% peak reduction (design range)	2-8 h emergency ride-through	>10% cooling energy savings
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The thermal capacity layer on top of liquid cooling

CHIP / COLD PLATE

MOFPoly nano phase-change coolant

Raises the heat absorption of existing cold plates and CDUs, cutting transient hotspots and peak junction temperature.

RACK / LOOP

UltraST thermal buffer module

Absorbs AI load swings and CDU shocks, stabilizes return-water temperature and extends the recovery window.

FACILITY / CAMPUS

Cooling Battery / containerized storage

Charge off-peak, discharge at peak, ride through failures and defer chiller and power expansion.

You are not buying more cooling — you are buying an end to permanent over-building, and a recovery window when things go wrong.



DEPLOYED · HIGH-LOAD AI COOLING

One material set, multiple infrastructure domains



COLD STORAGE & CHAIN

Off-peak storage & ride-through

SolarCool Kit and UltraST storage cores bring savings and outage protection to warehouses and refrigerated transport.



EDGE COMPUTE & TELECOM

Savings without replacing HVAC

18°C PCM modules plus free cooling keep cabinets in range with fast deployment and low maintenance.



LNG & INDUSTRIAL

Cold energy recovery & process peak shaving

Recovers regasification cold for the campus, or shifts thermal load in industrial processes to cut demand charges and running cost.



PHARMA COLD CHAIN & OFF-GRID

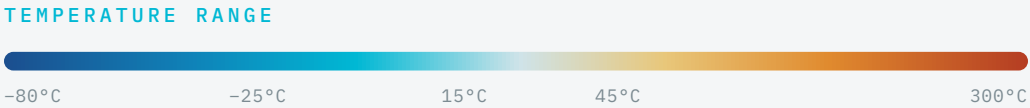
Reusable ride-through

UltraST PCM panels and cold-chain boxes carry vaccines and medicines; off-grid or through long outages, passive storage still holds the temperature band.

The same material platform is reused across domains — driving cost advantage and cross-domain validation.

APPLICATION MAP

One PCM core, mapped across the full application matrix



FLAGSHIP • MISSION-CRITICAL

TRL 9 • LIVE IN 10+ COUNTRIES



AI data center cooling 15~45°C

BUYS Hyperscale / IDC operators • OEM integrators

VALUE 20~35% peak shave • 2~8h ride-through • deferred build

1,000+ edge nodes live



Cold storage & chain -25~8°C

BUYS Cold-store owners • EPC

VALUE ~30% energy saving • outage hold

UK long-term deployment



Pharma cold chain 2~8°C

BUYS Vaccine / biologics makers • cold-chain logistics

VALUE Off-grid hold • full temperature record

Passive • no external power

INDUSTRIAL & ENERGY

60 ~ 300°C • COLD & WASTE HEAT



LNG cold recovery -80~-20°C

BUYS District-cooling operators • LNG terminals

VALUE >20% cooling-cost cut

In a leading DC campus



Industrial peak & waste heat 60~300°C

BUYS Process-industry campuses

VALUE Load shift • lower demand charges

Steam & hot-water systems



Grid & energy integration dispatchable

BUYS Grids / VPPs / storage operators

VALUE Thermal storage peaking • demand response

Complements electrochemical storage

EMBEDDED CONSUMER & OEM

EDGE MATERIAL INSIDE



Building comfort • edge comfort 22~32°C

BUYS HVAC / heat-pump / appliance OEMs

VALUE Passive control • peak shave • silent

Solar Decathlon net-zero homes



Electronics thermal control 15~45°C

BUYS Chip / battery / drive makers

VALUE Hotspot absorption • zero added energy

Coolant / microcapsule form



Temperature-regulating textiles 18~32°C

BUYS Performance fabric / apparel brands

VALUE Stable skin temperature • no power

Microcapsule fibre form

Kilotonne-scale pure PCM, with digital lines delivering consistency



KILOTONNE

PURE PCM CAPACITY

PLC + MES

DIGITAL MANUFACTURING

CONTINUOUS

ENCAPSULATION PROCESS

01

Synthesis & formulation

The advanced materials lab develops formulations and characterizes thermal properties, locking the property window before the line.

02

Micro/nano encapsulation

Continuous coating with in-line control of particle size and shell integrity; batch data recorded end to end.

03

Module machining & assembly

Shape-stabilization and 3D conductive structure machining; panels, blocks, cartridges and stacked cores assembled to BOM.

04

Factory acceptance

Enthalpy, conductivity, density and cycling sampling; batch reports and traceability records ship with the goods.

PCM certified to German quality standards

RAL Quality Association

Member; PE-O-5 carries a product-level quality mark, tested under the RAL-GZ 896 framework.



43 public TDS

Technical data sheets are public across the range; parameters are governed by the corresponding TDS and test reports.

ISO system & traceability

Systematic process management; batch, raw material and inspection records trace to a single production lot.

WIPO Green listing

Green-technology listing and granted patents support international compliance and ESG review.

Evidence grading

Grade A — third-party testing, customer-signed M&V, audited data

Grade B — project operating data confirmed by the customer

Grade C — simulation and design values, with assumptions stated

Grade A/B is validated evidence; Grade C is indicative only.

Running in mission-critical environments

10+ COUNTRIES TRL 9 OPERATIONAL

CHINA · EDGE COMPUTE	1,000+	Edge nodes on UltraST; up to ~30% cooling reduction with no AC replacement.
UNITED KINGDOM · COLD STORAGE	~30%	Energy savings · long-term commercial deployment, RAL-certified product.
SINGAPORE / CHINA · LNG COLD ENERGY	>20%	Cooling cost cut · integrated into a leading district cooling operator's campus system.
AFRICA / TANZANIA · OFF-GRID	16h+	Cooling without power · zero spoilage across 16h+ outages.

All items above are Grade A/B evidence; customers are described generically for confidentiality, with detail available under NDA.

Made in Ningbo, validated and channeled abroad

CHINA · NINGBO

R&D headquarters, material lines and module assembly; project validation and supply-chain base.

SOUTHEAST ASIA · SINGAPORE

Regional node: research and commercial front line for data centers, district cooling and LNG cold energy.

NORTH AMERICA · UNITED STATES

AI data center pilots and OEM joint validation, with local engineering support.

EUROPE / MIDDLE EAST / AFRICA

Advanced through equipment OEMs, energy service companies and engineering partners; RAL and EU standards friendly.



WAYS TO WORK WITH US

Material & module supply

Buy per kg / L / kWh and put it into your BOM and product line.

Joint development

Custom temperature range, encapsulation and interfaces for your duty, with test protocol and engineering support.

Licensing & regional JV

Local manufacturing and regional exclusivity, with quality audits and ongoing technical service.

B U I L D I N G A C O O L E R , S M A R T E R P L A N E T

Bring your heat problem upstream

Send us the duty, the temperature range and the constraints — we
come back with selection, samples and a test plan.

PROPRIETARY & PATENTED

REAL-WORLD VALIDATION

KILOTONNE CAPACITY

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