

Q-SMEC USE CASES

NAICS 2213 — WATER & WASTEWATER SECTOR

Quantum-anchored materials design for sensing, energy containment, and resilient infrastructure — custom-engineered to End User target specifications.

THE Q-SMEC MATERIALS DEVELOPMENT FRAMEWORK

/ 01

22-Layer Technology Stack

Q-SMEC (Quantum Superconducting Magnetic Energy Containment) enables custom design of advanced materials in layered architectures.

/ 02

Orders-of-Magnitude Performance

Performance characteristics several orders of magnitude better than current state-of-the-art alternatives, built to End User provided target specifications.

/ 03

TRL / MRL Maturation Model

NIKET matures a customized material through Non-Recurring TRL/MRL Levels 3–5 on internal/partner funding, and Levels 6–9 in close coordination with the Industry End User.

NIKET Q-SMEC — VALIDATED TRL/MRL LEVEL 3 APPLICABILITY TO WATER & WASTEWATER USE CASES

01 DESALINATION MEMBRANE

Superior to oxygenated graphene — producible in monolayer and stacked multilayer.

Q-SMEC membrane engineering targets 99.999% salt rejection across all six major rejection mechanisms — size exclusion, dehydration effects, charge repulsion, pore biophysics, pore chemical solute interactions, and entropic differences — with 99.999% uniformity in nanopore sizing and near-elimination of intrinsic and extrinsic defects.

TARGET SPECIFICATIONS

FLUX	150–200 L/cm ² /day/MPa
SALT REJECTION	99.999% • 6 mechanisms
NANOPORE UNIFORMITY	99.999%
DEFECTS	Near elimination

02 Q-SMEC SENSOR SUITE

pH	CHLORINE	TURBIDITY	DISSOLVED O ₂
VIBRATION	ACOUSTIC	PRESSURE	TEMPERATURE
HUMIDITY	FLOW	PROXIMITY	HYDROGEN SULFIDE
FLUID COMPOSITION	ELISA-QPCR	VOC	METHANE

16 Q-SMEC sensing modalities applicable across water and wastewater treatment, distribution, and collection infrastructure.

03 Q-SMEC OPTIMIZED SMART METER

Utility-grade metering with embedded Q-SMEC sensing, self-contained Q-SMEC storage power, and post-quantum-secure two-way communications.

- Up to 256 channels with NILM load disaggregation and real-time outage detection.
- Ten embedded Q-SMEC sensors: temperature (2), voltage (2), power (2), pressure (2), arc (1), tilt (1).
- Post-Quantum Crypto encryption; inherently anti-tamper; applicable across Front, Midlevel, and Backhaul domains.

KEY NOTIONAL SPECS

COMPLIANCE	ANSI C12.20
OPERATING VOLTAGE	120–480 V $\pm 0.1\%$
WAVEFORM STREAMING	5–15 kHz V/I samples
COMMS	5G 75 Mbps • ISM • 2.4 GHz
ENVIRONMENT	–40 to 85°C • 95% RH
POWER SUPPLY	Q-SMEC storage system

Full notional specification — scan the QR code below.

04 DEPARTMENT OF WAR-GRADE PQC OT/CIP CYBERSECURITY

Post-Quantum Cryptography for Operational Technology and Critical Infrastructure Protection in the water sector. Reference: SRP Cyber Resilience Pilot Proposal (34 pages).

BLUE RIDGE NETWORKS INC

HIGH ENTROPY SECURITY INC

BLACK FUR INC

05 WARGA-DESIGN FIRE-TUBE STEAM / HOT-WATER BOILER

Patented design with a 25+ year operational history at Tucson Medical Center.

Eliminates the inherent drawbacks of traditional 2/3/4-pass wetback and dryback designs.

- Optimized furnace volume, including a pressurized door.
- Analytically optimized tube configuration for heat-transfer dynamics.
- Flue-gas velocity ranging for maximum heat-exchange efficiency, even at partial loads.
- 50% reduction in heating surface area.
- Significant reduction in acquisition, installation, operation, and maintenance costs.



SCAN FOR FULL TECHNICAL SPECIFICATIONS

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