AwwaRF/CUWA-Sponsored POU Demonstration Project: "Unconventional" Approaches for Municipal Water Supply

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Background

- Awwa Research Foundation Project: Comparison of Conventional and Unconventional Approaches for the Provision of Water
- Partially funded and directed by CUWA
- Project on-going since Fall 2001 (hope to complete report by Fall 2003)
- A POU pilot study is an integral part of the project

The Stratus Research Team

Co-Principal Investigators

- Joe Cotruvo (J. Cotruvo Associates)
- Ramesh Narasimhan (NCS Engineering)

Other Key Players

- Regu (ReguNathan Associates)
- Joe Drago (Kennedy/Jenks Consultants)

Many other important contributors

Participating Organizations

- Water Quality Association (WQA)
- NSF International
- National Rural Water Association
- Kinetico and Access Business Group
- Los Angeles Department of Water and Power
- Contra Costa Water District
- San Jose Water Co.
- BHC Co./Aquarion (formerly Bridgeport Hydraulic)
- City of Cincinnati
- Southern CA Water Company

Project Objectives

- What will public water supplies be like in 2024
  - What products and services will they provide?
  - How will they deliver them?
- What major driving forces will lead to changes in what and/or how services are provided?
- What are the options for how utilities will provide water-related services in the future?
- Which options are most viable and promising? Why?

Project Is in Two Phases

Phase 1 specifically targeted at POU pilot studies

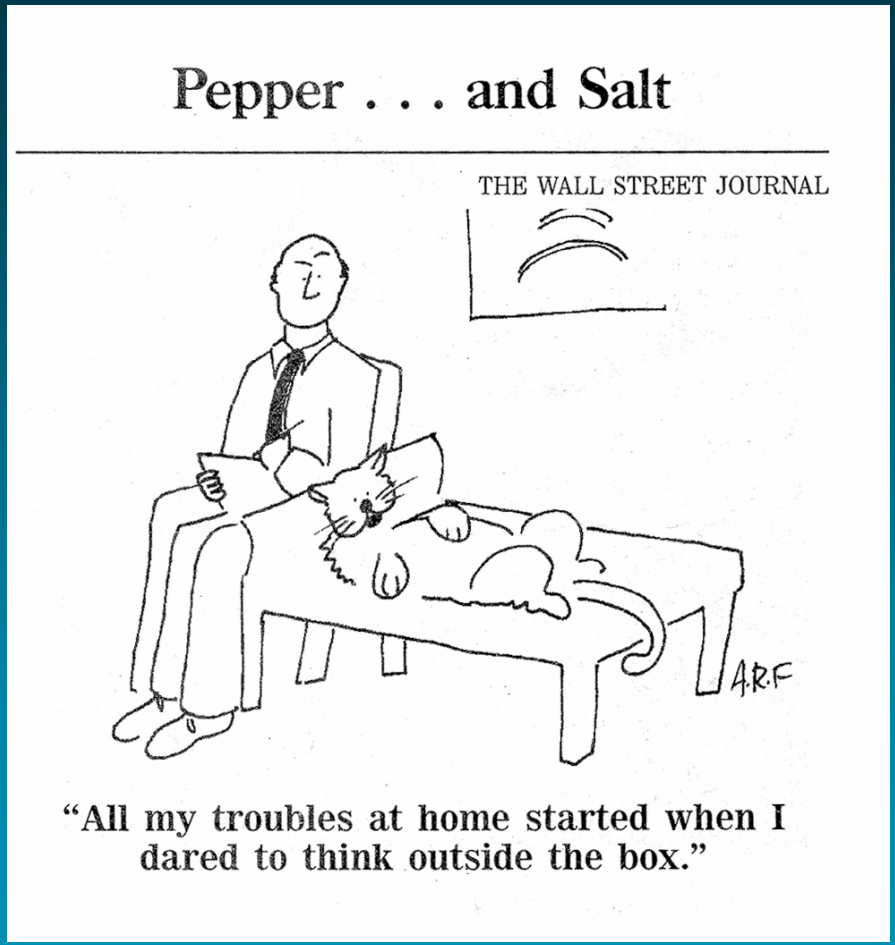
- Two large urban California water utilities
  - Contra Costa and Los Angeles
  - Units installed in homes and central pilot sites

Phase 2 provides a broader perspective

- Other "unconventional" approaches public water suppliers need to consider for the 21st century
  - POE, bottled water, reuse, decentralized treatment, etc.

Security-related add-on

- Vulnerability and response aspects of supply options

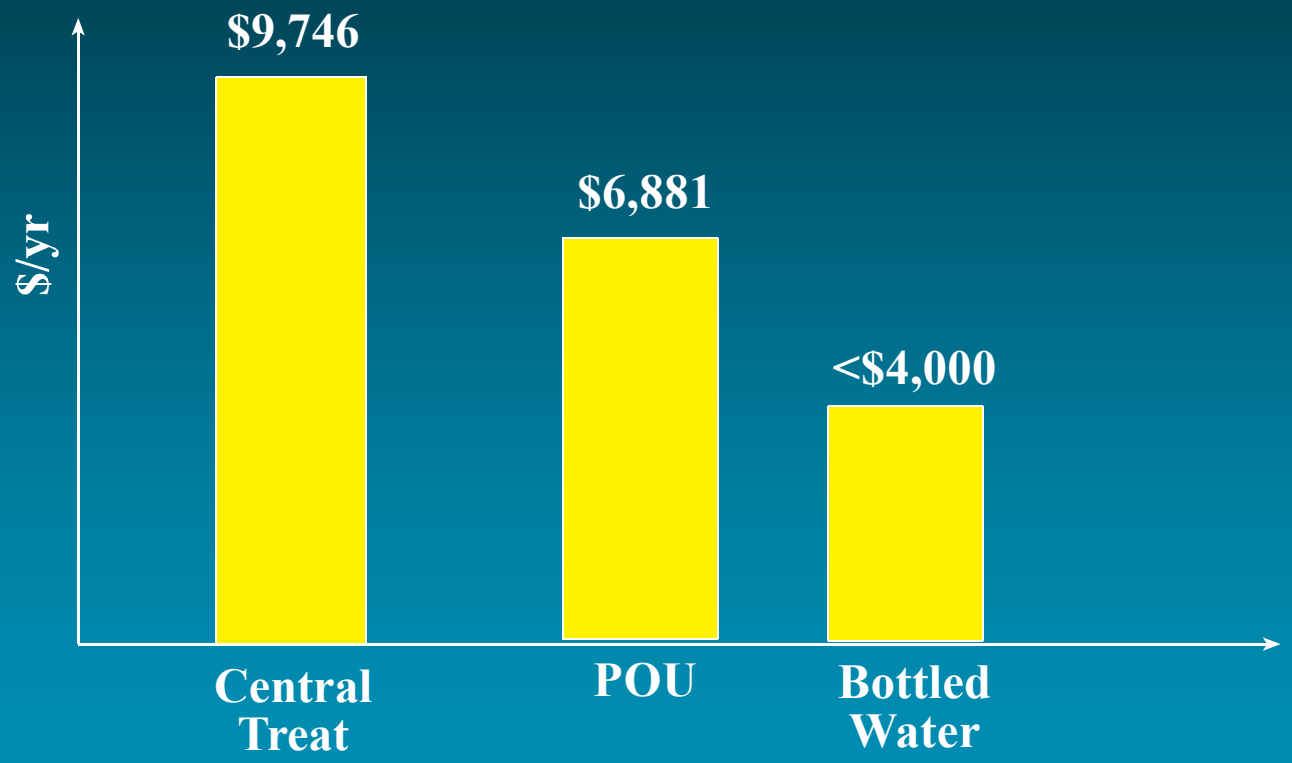


Source: The Wall Street Journal.

Questions about POU and Compliance

- Performance: Achieve necessary reductions?
  - ANSI/NSF testing and certification
  - Utility-specific water quality
  - Parameters beyond NSF certification
- Is it cost-effective?
  - Relative to large-scale, high end central treatment
  - Accounting for likely regulator-imposed requirements
  - Factoring in administrative and maintenance costs

Cost Comparison for Very Small Systems



Total Annualized Costs for Arsenic Compliance

Source: Midpoint estimates for CWS of 25-100 served, from U.S. EPA, 2000.

Other Utility Concerns

Customer acceptance

- Allowing periodic home access
- POU unit appearance and space requirements
- Performance: Water quality and aesthetics

Regulatory agency acceptance

- Ownership, access, and control issues
- Requiring 100% household participation
- Implementation requirements (canister replacement, monitoring, etc.)

Other Utility Concerns (cont.)

- Legal liabilities
  - Health effects and torts
  - Property damage, worker injuries, harassment, etc.
  - Disaffected vendors, manufacturers
- Utility capabilities
  - Business model fit, outsourcing, public relations
- Public perception of utility activity
  - Perceived as a lack of faith in delivered water?

Phase 1 Pilot Test Design

- Three under sink treatment trains
  - GAC (Kinetico)
  - GAC with RO (Kinetico)
  - GAC with UV (Amway/Access)
- Additional units also being tested
  - Manganese-enhanced AA (arsenic removal)
  - End-of-faucet GAC (PUR); not pursued by LADWP

Phase 1 Pilot Design (cont.)

Household-based pilots in each utility

- CCWD: Volunteer customer households (20)
- LADWP: Utility employee homes (20-24)

Central facility pilots

- CCWD: Filtration plant, plus distant pump station (distribution system water)
- LADWP: Filtration plant, plus distant power station (near Owen's River source water)

Anticipated Results from Phase 1

- Regulatory compliance using POU
  - Unlikely to be cost-effective for large urban systems unless targeted to a few homes (e.g., high DBP zone)
  - Likely to be suitable, cost-effective in small systems
  - Costs can be driven by regulator-imposed requirements (e.g., monitoring, maintenance)
- POU may be valuable as a "supplemental service" offering by large municipal systems
  - Utilities would offer their customers a service many already buy or want (bottled or home-filtered water)

Value Added by Utility-Sponsored POU

Utilities offer customers established relationship:

- Trust, quality assurance (not "snake oil")
- Information and expertise (what unit is "right" for their water)
- Administrative simplicity (one water bill and payment)

Utilities most likely to approach this market in partnership with private vendor(s)

- Unlikely to try to "go it on their own"

Phase 1 and Related POU Research Results

- Customer acceptance in CCWD and LADWP is very positive about sink units, and very supportive of a utility role in service provision
- Water quality performance in CCWD and LADWP: Good removals (as expected)
- Arsenic-related POU work by AwwaRF and EPA revealing additional insights

Regulatory Implementation Issues

- 100% enrollment if recalcitrant households
  - Can 1 person hold entire community hostage?
  - What if household drops out after program in place?
  - Denying water service: Raises bigger concerns?
- Monitoring requirements and interpretation
  - Not same as central treatment system regime
  - If above MCL, replace canister and recheck

Regulatory Implementation Issues (cont.)

- Maintenance: Canister replacement frequency
  - Designed, tested, certified for > 1500 gallons
  - Auto shut-off at 500 gallons (1 to 2 years of use)
  - US EPA *Guidance* calls for replacing every 6 months (1 L/day × 3 people × 183 days = 148 gallons)
- Single faucet versus whole house treatment
- Waste disposal issues (canisters, or reject water)

Regulators Need to Find a Suitable Balance

- If safety margins too precautionary, POU loses cost effectiveness (e.g., canister replacement)
- Chronic versus acute risk: needs to be considered (e.g., for monitoring regime)
- If POU discouraged, the alternative may be:
  - Very high compliance costs for households, or
  - Prolonged noncompliance for some small systems (i.e., no additional public health protection)

Phase 2 of the Project

- Provides a broad perspective (beyond POU)
  - Wide range of "unconventional" approaches
  - Drivers include water scarcity, regulatory pressures, and consumer demands
- Options evaluated against numerous criteria
  - Regulator requirements and customer acceptance
  - Technical feasibility and performance, comparative economics, liability concerns, utility capabilities, etc.

Future Municipal Water Supply Issues

Water utilities have two distinguishable functions as the supplier of:

1. A small volume of premium quality water for drinking and cooking (0.33% of total HH use is for ingestion)
2. Bulk water for other uses (HH, CII, fire protection, etc.)

The current convention is for water utilities to

- Not distinguish between water end uses, and
- Perform all water treatment at a central plant and distribute treated water through a piped system

Phase 2 of this Project Examines:

- Feasibility, advisability, and implications of separating those two functions
  - Premium, safe water for direct consumption
  - Bulk water for other purposes
- May result in a fundamental redefinition of "public water supplier"

"Unconventional" Options Evaluated

(1) Premium central treatment (baseline approach, plus…)

(2) Universal POU/POE where cost-effective (in certain small systems with no or minimal central treatment)

(3) Central treatment supplemented by utility managed POU/POE (or bottled water)

(4) Decentralized systems where this provides quality and economic advantages (e.g., neighborhood scale)

(5) Dual distribution networks (greenfield, or perhaps in concert with infrastructure renewal)

(6) Water reuse and reclamation

Drivers for Changing with the Times

- Quantity demands grow with population & income
- Increased consumer demand for quality, aesthetics
- Diminished access to high quality source supplies
- More regulations, and more stringent regulations
- High cost and complexity of treating large volumes

Conclusions

- Growing interest in — and role for — POU & other unconventional approaches
- POU & other approaches raise issues for state and federal regulators: What is acceptable for compliance?
- Do cost advantages enable greater compliance and better public health protection (small CWS)?
- Specific provisions: safety margin v. costs?
- State administrative feasibility, burdens, and costs?
- Implications for regulators beyond MCL compliance