WATER CONSERVATION PLANNING IN THE USA

ORGANISED BY
THE ENVIRONMENT AGENCY AND CIWEM

9.00am on 14th June 1996
Methven Room, CBI

WATER CONSERVATION PLANNING IN THE USA

14th June 1996, Methven Room, CBI

Conference Programme

0900-0930	**Registration of delegates,** and coffee on arrival, in Concourse area at CBI Conference Centre.
0930	Introduction and opening address, **Lord De Ramsay, Chairman of Environment Agency**
0945	Integrating water conservation and water resources planning **Graham Wilson, Environment Agency.**
1015	Case Studies • Massachusetts Water Resources Authority • United Water New York **Amy Vickers, George Raftelis**
1120	Coffee
1140	Case Studies (continued) • Cape May • New York Dept of Environmental Protection **Amy Vickers, George Raftelis, Steve Ostrega**
1245	Lunch
1400	Suggested framework for UK water conservation planning **Amy Vickers/ David Howarth**
1430	Questions/discussion
1440	UK responses/experience • Dr Clare Ridgwell, Essex and Suffolk Water company • Robin Simpson, National Consumer Council • Dr Tony Ballance, OFWAT • Bob Adsett, Bradford Metropolitan Council • John Foxley, Southern Water Services
1530	General discussion
1550	Closing remarks/ summary **Peter Herbertson**
1600	Close and Tea

INTEGRATING WATER CONSERVATION AND WATER RESOURCE PLANNING

Graham Wilson
Regional Water Resources Manager
Environment Agency Anglian Region

Conference Programme

- Introduction to integrating water conservation and water resource planning
- Case studies of USA practice
- Key steps in water conservation practice
- UK responses and experiences
- General discussion

Conference Objectives

- Describe water conservation in the USA
  - case studies
  - CONSERV'96
- Discuss applicability to UK

Water Conservation

"Any beneficial reduction in water use or water losses where the following apply:

- reduction in water use
- measures result in a net increase in social welfare"

Maddeus 1987

Integrating Water Conservation and Water Resource Planning

- Outline of USA study
- Background to water conservation
- Comparisons with USA
- Ideas from CONSERV'96
- Summary

Consultants

- Amy Vickers, Consultant Team Project Director
  Amy Vickers & Associates, Inc
- George A. Raftelis, Utility Financial Management
  Raftelis Environmental Consulting Group, Inc
- Rick D. Giardina, Utility Financial Management
  Rick Giardina & Associates, Inc

Project Objectives

- Evaluate US water conservation methodologies and experiences
- Improve knowledge of potential options for England and Wales

Scope of Work

- Review of Water Conservation and Demand Management Manuals in the USA
- Report of CONSERV'96
- 4 Water Conservation Program Case Studies

Case Studies

- Massachusetts Water Resources Authority
  (Jonathan Yeo)
- United Water
  (Frank Gradilone III)
- New York City
  Steve Ostrega Deputy Commissioner of New York City Department of Environmental Protection
- Cape May
  David Carrick

Case Studies

- Massachusetts Water Resources Authority (Andy Turner)
- United Water (Nick Berry)
- New York City (Debbie Jordan)
- Cape May (Amy Vickers)

NRA/Agency Project Team

- Demand Management Centre (Southern Region)
  - Peter Herbertson
  - David Howarth
  - Nick Berry
- Thames Region
  - Brian Arkell
  - Debbie Jordan
- Anglian Region
  - Graham Wilson
  - Andy Turner

Integrating Water Conservation and Water Resource Planning

- Outline of USA study
- **Background to water conservation**
- Comparisons with USA
- Ideas from CONSERV'96
- Summary

Water Conservation

- NRA Water Resources Strategy (Water, Nature's Precious Resource)
- OFWAT - economic levels of leakage
- Water company duty to promote water efficiency
- Prof Uff - joint promotion of water conservation

Saving Water

- NRA Consultation Report
- Identified ways to save 40%
- Selective metering
- Reduce leakage
- Dual flush toilets

Water Nature's Precious Resource

- Promote and encourage the efficient use of water including:
  - selective domestic metering
  - economic levels of leakage
  - promotion of more efficient use of water in the home, by industry and agriculture

Integrating Water Conservation and Water Resource Planning

- Outline of USA study
- Background to water conservation
- **Comparisons with USA**
- Ideas from CONSERV'96
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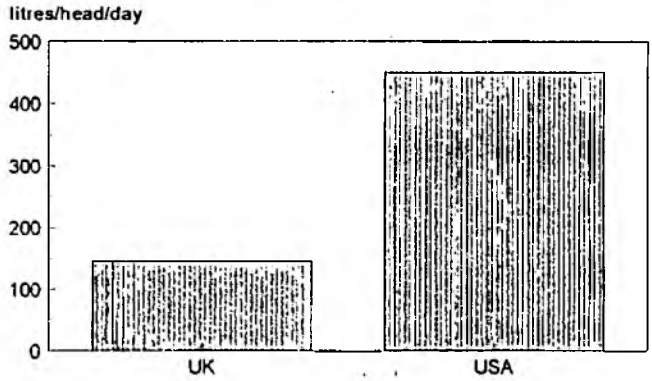
UK/USA Comparisons

	UK	USA
No. of utilities	31	60,000 <100 supply majority
Ownership	private	25% private

Meter Penetration

	UK	USA
1995	0 - 20%	0 - 100%

Domestic Consumption (excluding leakage)



Domestic Water and Sewage Bills

	UK	USA
£/household /year		

Integrating Water Conservation and Water Resource Planning

- Outline of USA study
- Background to water conservation
- Comparisons with USA
- **Ideas from CONSERV'96**
- Summary

CONSERV'96

- Tariff Structures
- Community involvement
- Educational programmes
- Toilet replacement programmes
- Leakage
- Agriculture
- Landscape
- Industry and commerce
- Water re-use
- Conservation planning

CONSERV'96

- Technical sessions (8 simultaneous)
- Workshops
- Software Demonstrations
- Study Tours
- Attendance >900

Regulation

- US Energy Policy Act 1992
  - 6 litres/flush toilets
  - 9.5 litres/minute taps and showers
- Local/state legislation

Toilet Flush Volumes (litres/flush)

	UK	USA
Old toilets	9	25
New standards	7.5	6
Saving per flush	1.5	19

Commercial and Industrial

- Motivation
  - cost reduction
  - regulatory compliance
  - preservation of normal operations
  - protect environment
  - image

Retrofit

- Various programs:
  - free/subsidised/at cost
  - voluntary vs compulsory
  - different kits distributed
- Toilets, showerheads and taps
- Toilet replacement part of overall conservation and supply program

Commercial and Industrial

- Phoenix Mayor's Water Conservation Awards
- Combined energy and water conservation
- EPA WAVE programme
- Audits

Public Involvement

- public - private partnerships
- community action teams

South West Florida

- Preferred option in descending order of <u>appeal</u>:
  - effluent irrigation
  - desalination
  - aquifer storage and recovery
  - repurified/in-direct potable
- Preferred option in descending order of <u>perceived safety</u>
  - desalination
  - effluent irrigation
  - aquifer storage and recovery
  - repurified/in-direct potable

South West Florida

- 60% conserve to protect/sustain the existing water supply
- 27% did not know the source of their water
- 76% supported inverted rate structures
- 67% would pay 10-50% more for water
- 64% would rather use a new source than use less of their existing source

Education

- Practical methods to save water and money
- Awareness of the water environment

Education

- In Concert with the Environment
  Southern California Water/Energy Conservation Partnership
- Water Ambassador Program
  Tampa Water Dept
- "Bringing the Message Home - Learning to be Water Wise and Energy Efficient
  Harris-Galveston Coastal Subsidence District, Friendswood, Texas
- Internet - Water Wiser and National Drought Management Centre
  AWWA

San Antonio Water Bill

Finance and Rates

- Meters
- Correct rate structure essential for water conservation
- Rising block or seasonal rate structure gives signal
- Protection for low income families
- CUWCC Urban Retail Water Rates Project handbook providing utilities with guidance in implementing efficient rate structures

Landscape

- Artificial environments
- Promotion of good irrigation practices
- Move towards xeriscaping

Re-use

- Re-use releases potable supplies for other needs
- Greater public acceptance to use of greywater
- Reclaimed water used extensively for landscaping and irrigation

Integrating Water Conservation and Water Resource Planning

- Outline of USA study
- Background to water conservation
- Comparisons with USA
- Ideas from CONSERV'96
- **Summary**

Leakage

- Typically 13 - 20%
- Regular survey methods
  (District metering rare)

Water Conservation

INCENTIVES AND MEASURES

- Incentives
  - tariffs
  - regulation
- Measures
  - Hardware
    - retrofitting
  - Behaviour
    - education
    - water audits

Win - Win - Win Strategy

- WIN - Environment - less water abstracted

Win - Win - Win Strategy

- WIN - Environment - less water abstracted
- WIN - Customer - lower bills
- WIN - Water company - community support, lower treatment costs and deferred resource development

Win - Win - Win Strategy

- WIN - Environment - less water abstracted
- WIN - Customer - lower bills

Environment Agency &

The Chartered Institution of Water And Environmental Management

Water Conservation Planning in the USA

London

Friday 14 June 1996

Amy Vickers & Associates, Inc.

Water Planning, Policy, and Management

Amherst, Mass.

Presentation Outline

1. Introduction
2. USA Water Conservation Case Studies:
    A. Massachusetts Water Resources Authority
    B. United Water Company/New York
    C. Cape May Water & Sewer Utility
    D. New York City
3. Closing: Three Messages

1. Introduction

- USA Water: Basic Facts
- The "Conservation Mandate"
- USA Conservation Milestones and Trends
- Potential Water Savings from Conservation
- Conservation Costs and Benefits
- Balancing Supply and Conservation Options
- Strengths and Weaknesses in US Water Use Efficiency Practices and Approaches

○ *USA Water: Basic Facts...*

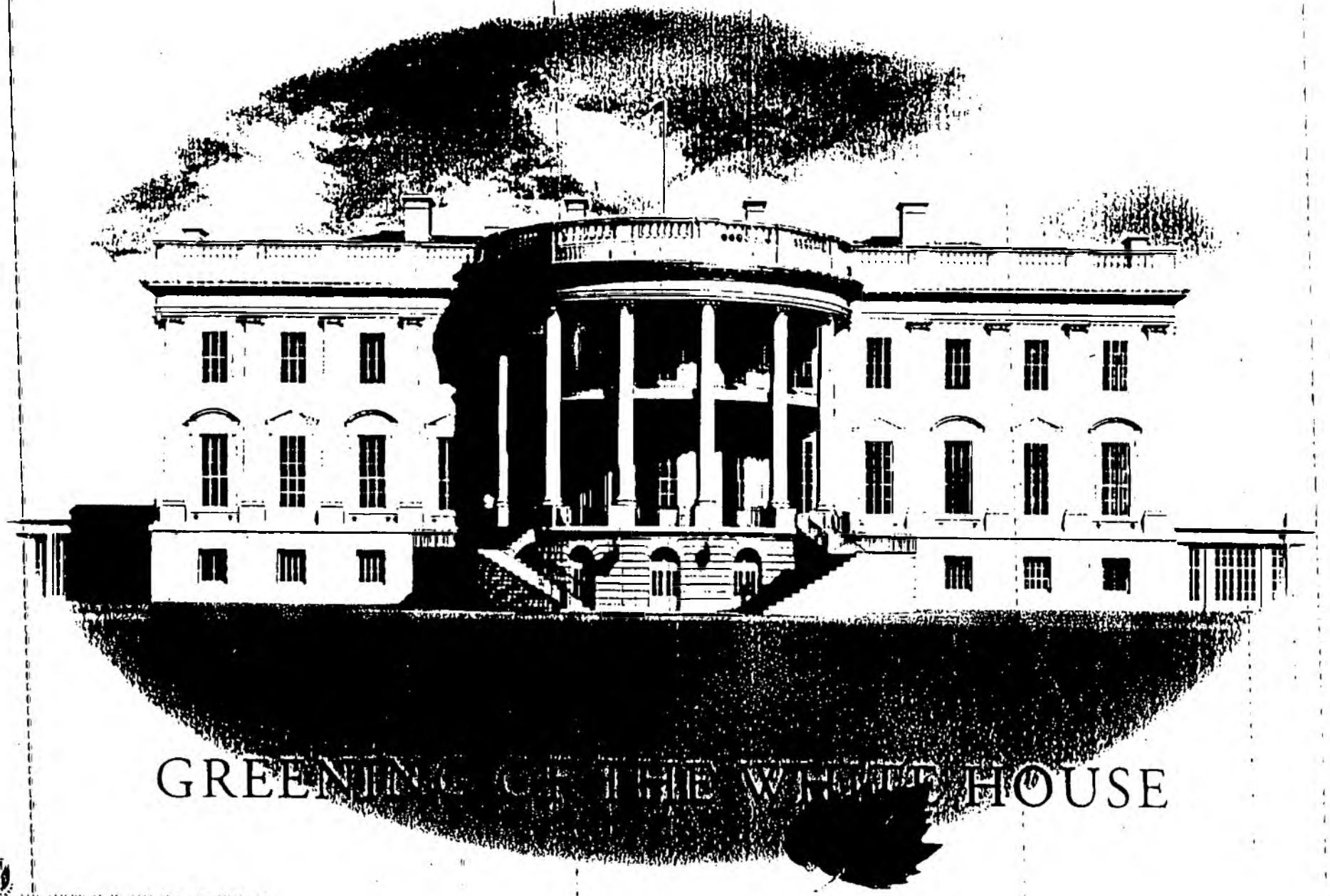
- US population = 260+ million
- 60,000+ water utilities
  - *75% public, but privatization trend is growing*
- Most large, urban systems are surface water and are municipally managed and self-regulated
- US water industry unaccounted-for water is usually reported in 13 to 20% range (measured by a metered-billing ratio)
- US *domestic* per capita demand 473 l/h/day
- Water use by plumbing fixtures is expected to reduced 30-60% by 2025 due to national water efficiency standards established by the 1992 US Energy Policy Act

The Conservation Mandate...

- *Insufficient or unstable water supply*
- *Long-term demand projections exceed available supply or system safe yield*
- *Water quality protection*
- *Wastewater treatment system at or near capacity*
- *Costly capital expansion options*
- *Inefficient water use*
- *Community resource preservation values*
- *Affordability*
- *"Water Wars"*
- *Utility credibility*

❍ *USA Conservation Milestones and Trends...*

- *USA conservation: wet and dry, high and low*
- *The ULV/"1.6" (6-litre flush) revolution: U.S. Energy Policy Act*
- *AWWA Water Conservation Committee*
- *Orlando/Conserv96... 900+ conference attendees*
- *"Water Wise" states*
- *The Greening of the White House, CD-ROM*
- *National (AWWA) Water Efficiency Clearinghouse*
- *http://www.waterwiser.org*



GREENING OF THE WHITE HOUSE

THE AMERICAN INSTITUTE OF ARCHITECTS

Computer modeling, rendering and graphics by Franco Iriarte and Mieczyslaw Berysławski of View By View, Inc., San Francisco, CA

❍ *Potential Water Savings From Conservation (US) To Date: 10-25%*

- Utility (unaccounted-for water)
- Domestic
- Commercial/Business
- Industrial
- Public/Institutional
- ★ Agricultural

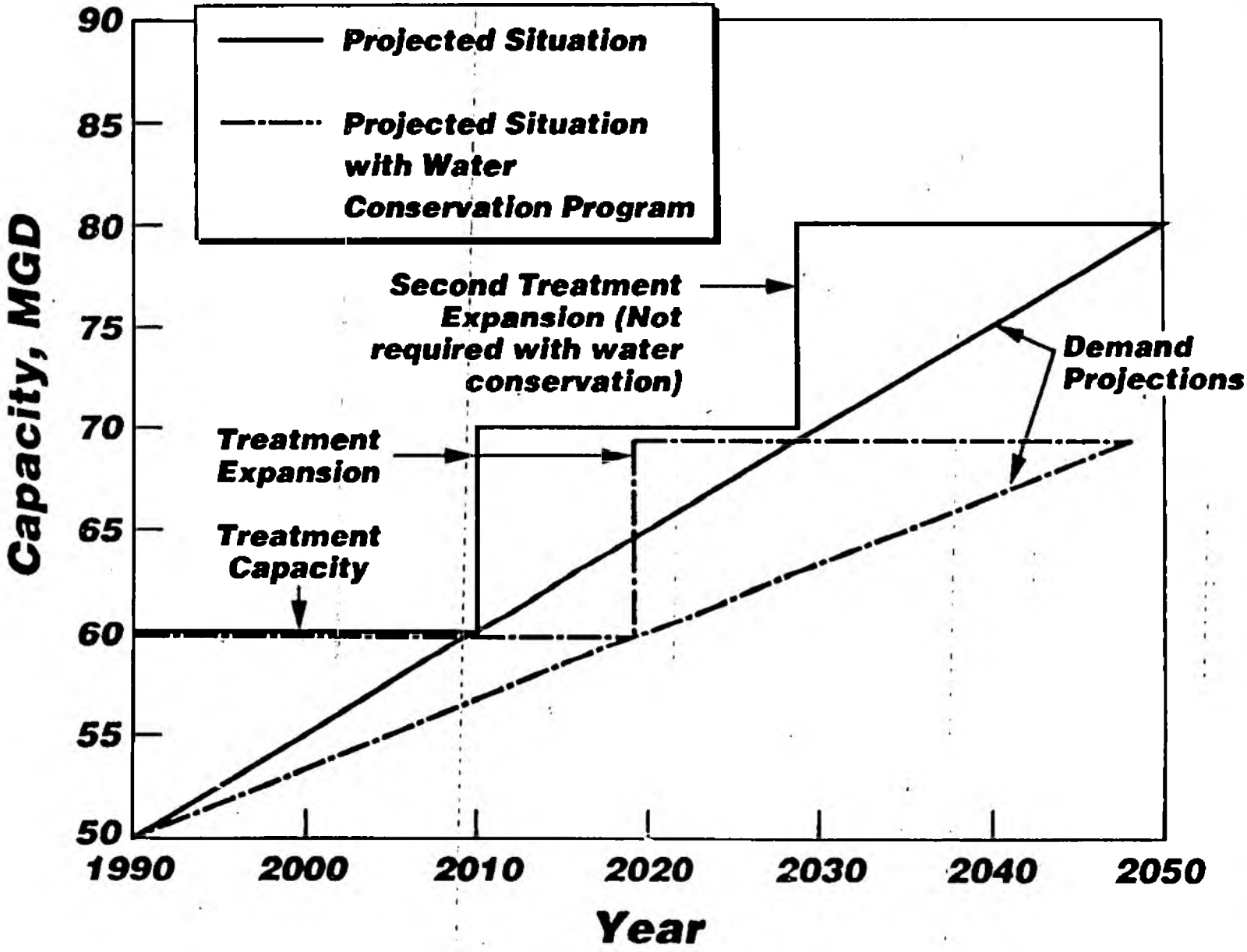
Conservation Costs & Benefits...

- Water savings
- Program benefits
- Program costs

Conservation Program Benefits:

- *Water savings*
- *Utility cost savings*
  - *Reduced water purchases*
  - *Reduced operation and maintenance costs*
  - *Deferred, downsized, or eliminated new facilities*
  - *Program cost-sharing*
- *Program participant benefits*
  - *Reduced water bills*
  - *Reduced wastewater bills*
  - *Reduced energy bills*
  - *"Paybacks"*
- *System reliability*
- *Environmental preservation*
- *Public credibility*

PROJECTED DEMAND AND REQUIRED TREATMENT CAPACITY EXPANSION

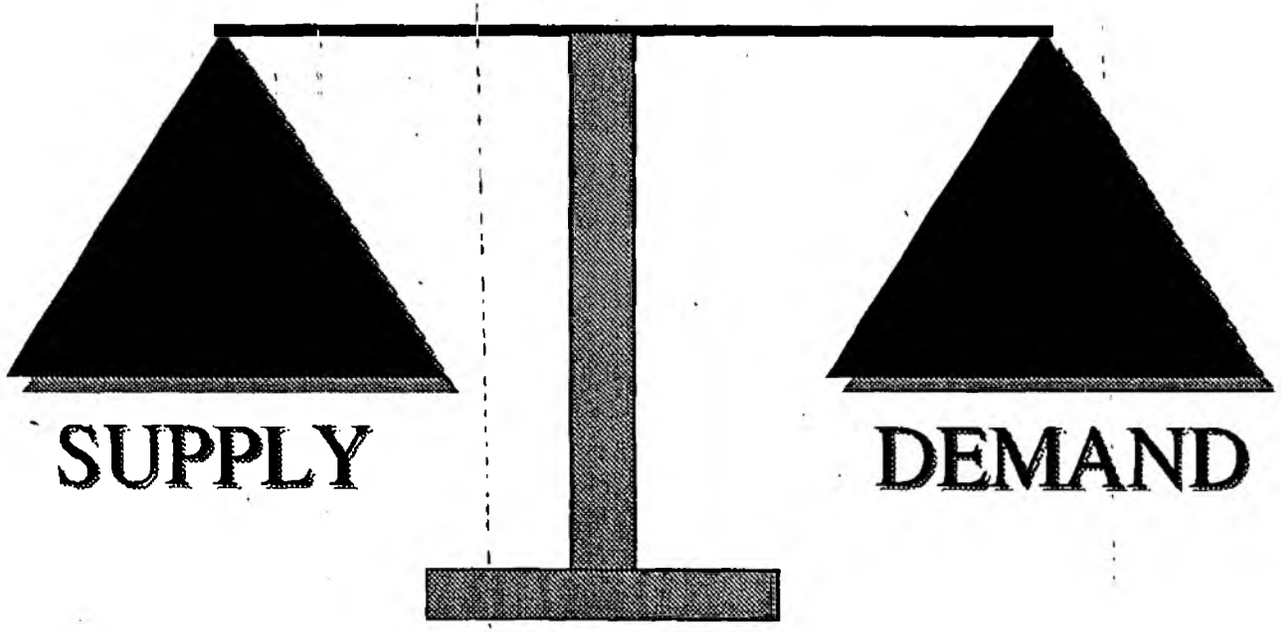


Conservation Program Costs:

- *Water utility program costs*
  - *Administration, consultants*
  - *Hardware and materials*
  - *Training*
  - *Field labor*
  - *Incentives*
  - *Public education, program marketing*
  - *Program evaluation*
- *More frequent rate adjustments*
- *Fluctuations in utility revenues*
- *Program participant costs*
  - *Adjustments to new behavior and management requirements*
  - *Acceptance of new design aesthetic*
  - *Equipment, materials, installation*
  - *Operation and maintenance*

❍ *Balancing Water Supply and Conservation Options…*

Integrated Water Resource Planning (IRP)



❍ *Strengths and Weaknesses in US Water Efficiency Practices and Approaches...*

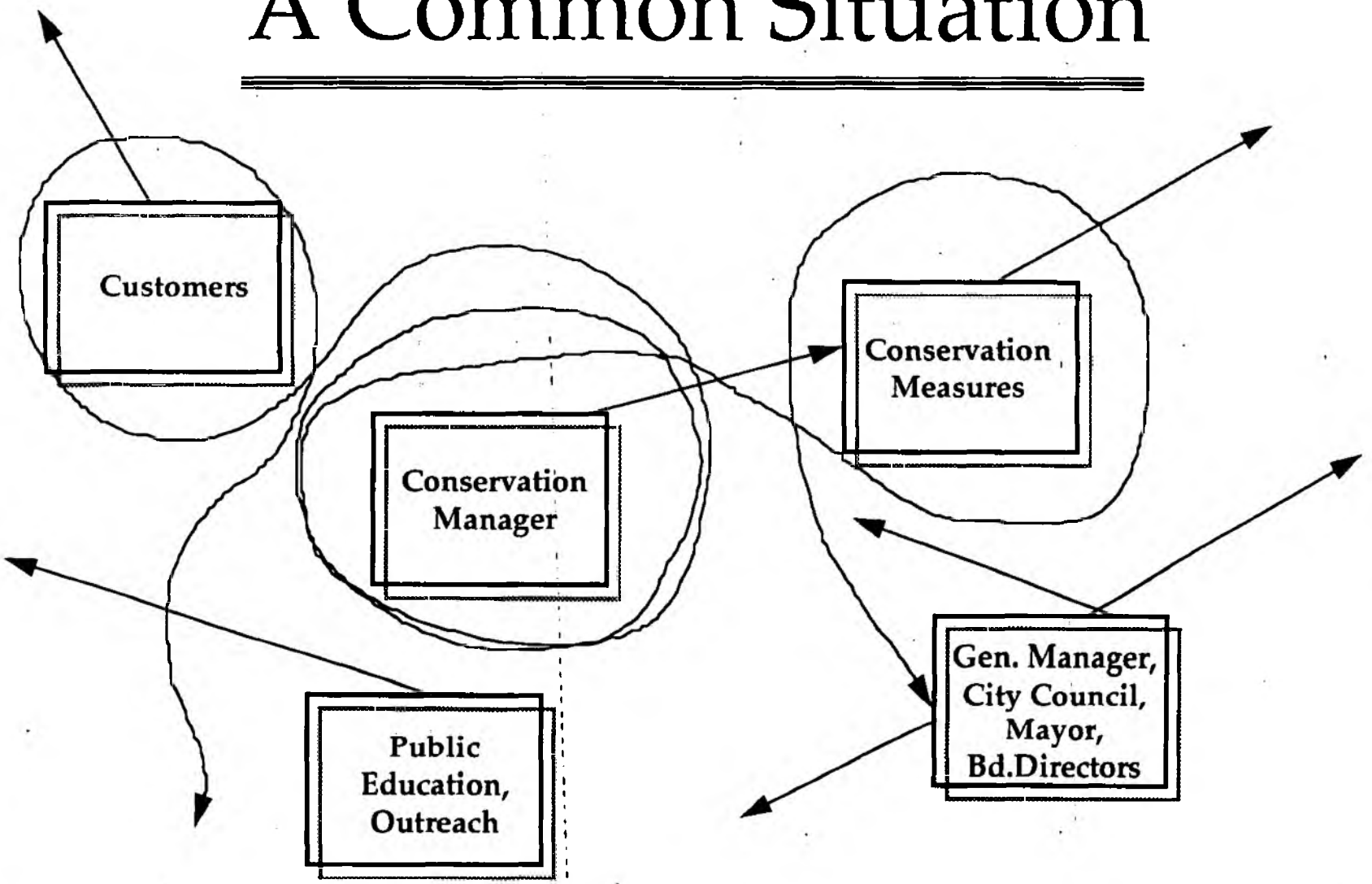
Strengths

- Conservation "movement" is becomming integrated into mainstream US water industry.
- Many good examples of cooperative relationships between water utilities, government agencies, environmental groups and others.
- US conservation network is strong and resources continue to expand.
- Growing number of successful urban conservation programs that have measurable results, with 10-25% water savings.
- Potential savings among industrial-commercial customers est. = 15-80%
- Potential savings among agricultural water uses est. = 10-40%
- 1992 (EPAct) national water use efficiency standards for plumbing fixtures : est. 30-60% projected savings per US household by 2025.
- Water efficiency standards for appliances are s-l-o-w-i-n-g improving.
- Water conservation and pollution prevention programs are working together in some instances, creating a synergistic effect.
- US government facility conservation programs are getting established.

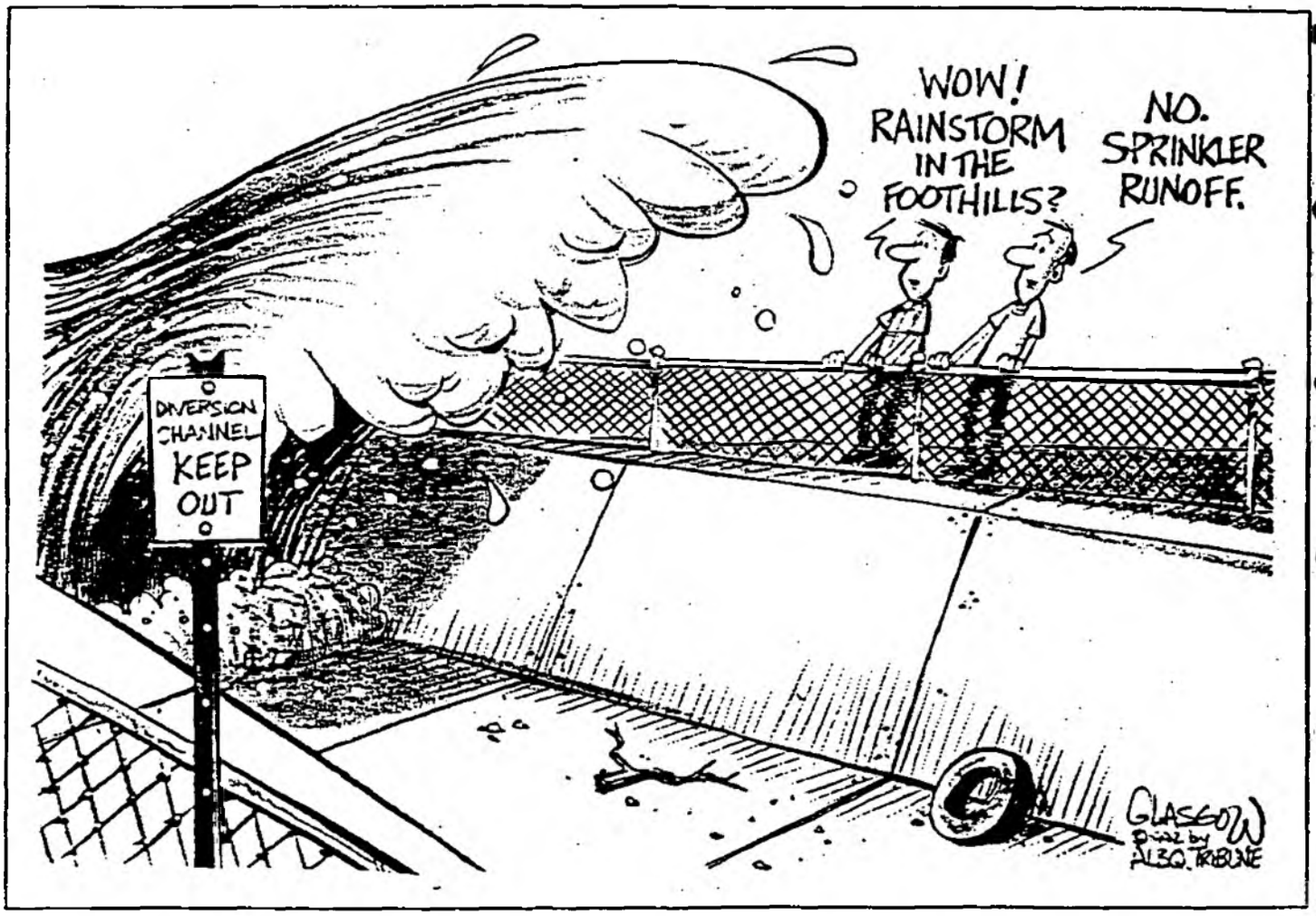
Weaknesses

- Utility water loss and leakage accountability is poor; UFW water industry standards are lacking.
- US water industry definitions of conservation and its practices are often inconsistent and fuzzy.
- Conservation is still considered "fringe" by some.
- Conservation pricing signals are not uniform.
- More talk than action by many utilities.
- Discretionary water use appears to be increasing via Baby Boomers' new toy trends (jacuzzi, gardening, pool, etc.).
- Reuse and desalination are being pitched as "solutions" - despite their high cost - before conservation potential has been realized.
- In most cases, the public is not well informed of its future water supply and conservation options - and associated costs they will pay.
- Research money for conservation is short and somewhat misdirected; Much baseline work remains to be done.

A Common Situation



Tribune July 14 '92



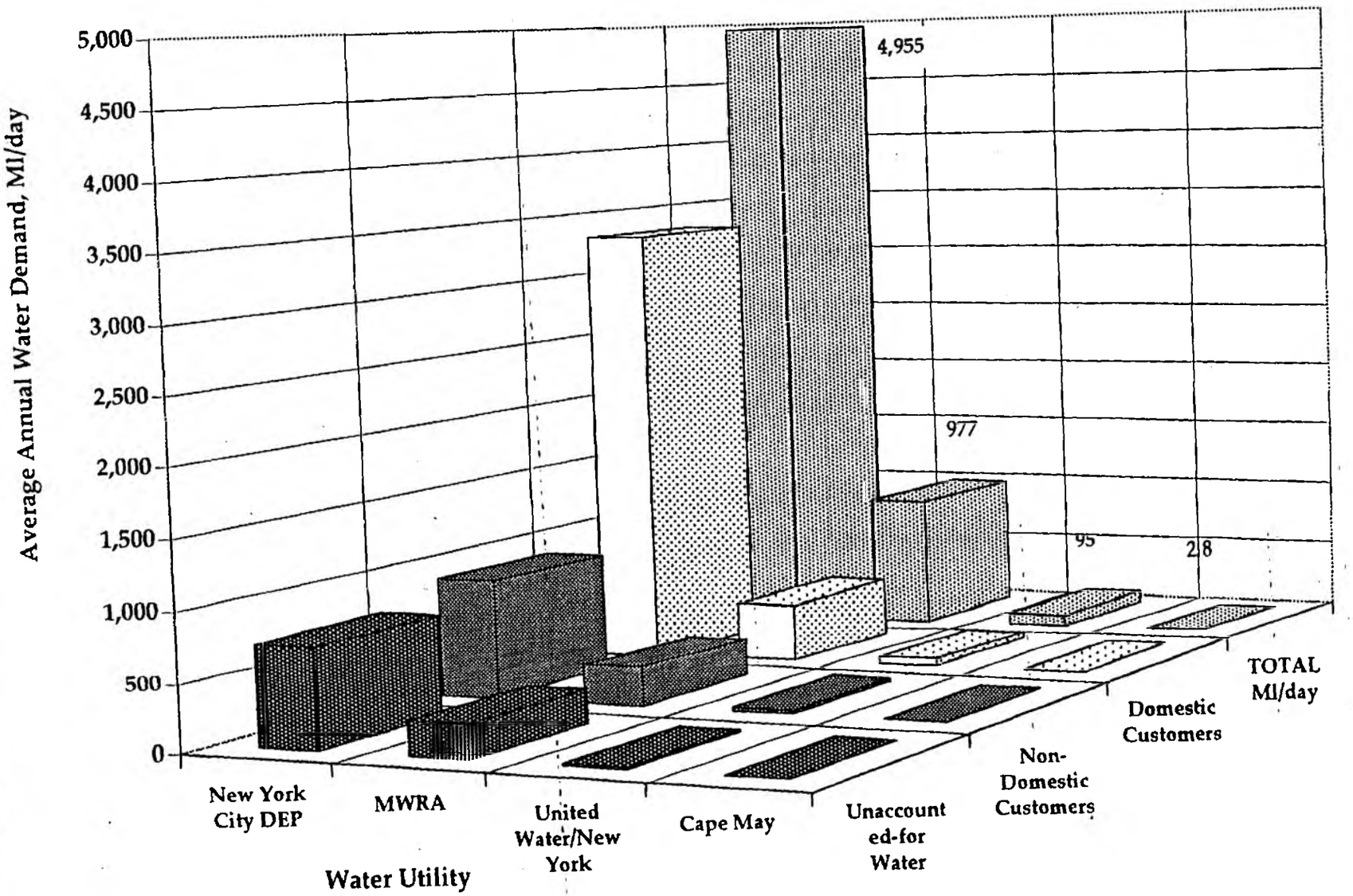
2. USA Case Studies

- Massachusetts Water Resources Authority
- New York City Department of Environmental Protection
- United Water Company/New York
- Cape May Water & Sewer Utility

SUMMARY OF UTILITY & SERVICE AREA CHARACTERISTICS

Water Utility	Operation	Sources	Service Area	Length of Water Mains (km)	System Safe Yield, Avg. Day (Ml/day)	Annual Avg. Day Demand (Ml/day)	Unaccounted-for Water	Current Domestic Per Capita Demand, Est. (l/h/d)	Avg. Annual Domestic Customer's Water & Sewer Bill
Massachusetts Water Resources Authority	Wholesale supplier, publicly owned by state	Surface, metered	2,500,000 population; 61 municipalities (47 water, 43 sewer) in Boston-metro area, urban and suburban mix	10,073	1,136	977	25%	265	£393
New York City DEP	Retail and wholesale supplier, publicly owned and managed by City	Surface, 80% metered (100% by 1998)	11-12 million population; primarily urban, some suburban communities	9,420	4,883	4,955	15%	416	£245
United Water/New York	Retail supplier, investor-owned	Primarily ground, metered	230,000 population; suburban community outside NYC	1,463	144	95	18%	276	£287 (water only)
Cape May Water & Sewer Utility	Retail and wholesale supplier, publicly owned and managed by City	Ground, metered	6,000 year-round, 50,000 summer population; residential and guest accomodations for large summer tourist influx	64	4.8	2.8	3% (system only)	227	£568

COMPONENTS OF WATER DEMAND, 1995, AVERAGE M/day



CONSERVATION STRATEGIES & WATER SAVINGS BY CASE STUDY UTILITIES

Water Utility	Conservation Incentives			Conservation Measures		Water Demand Reductions*
	Educational	Regulatory	Financial	Hardware	Behaviour	
Massachusetts Water Resources Authority	Metering, targeted programme materials	Contract utilities conservation criteria, state ULV law, US Energy Policy Act, source protection	Inclining tariff structures by its wholesale customers	UFW detection/repair; domestic device retrofit; public buildings ULV replacement;	ICI water audits	23%, 1987-present
New York City DEP	Metering, customer service outreach, building managers training programme, school education, general and targeted programme materials	Local and state ULV laws, US Energy Policy Act, source protection	"Window of Opportunity" programme for newly metered MF accounts; uniform rate tariff	UFW detection/repair, citywide toilet rebate program, 120,000-household water and energy retrofit, retrofit of 40,000+ public housing units	domestic and ICI water audits, enforcement of ULV law	7.4%, 1991-1995
United Water/New York	Metering; bill inserts	State ULV law, US Energy Policy Act	Summer use surcharge	UFW detection/repair; voluntary fixture retrofit kit delivery	ET-programme	6%, 1993-present
Cape May Water & Sewer Utility	Metering, targeting of top 10% of users, Xeriscape demonstration garden, awards program, public exhibits, literature distribution	Outdoor water use restrictions, automatic shut-off hose nozzles and rain sensors, state ULV law, US Energy Policy Act	Inclining tariff structure, summer use surcharge, one-time £33 conservation credit	UFW repair, retrofit kit offering, fixture replacement in all City and public housing facilities	ICI water audits	15-20% (of projected future demands), 1987-present

SUMMARY OF CONSERVATION PROGRAMME COSTS AND BENEFITS

Water Utility	Cost of Capacity Expansion Options	Conservation Programme Costs, Est.	Avoided Cost Savings (Benefits)		Approximate Benefit-Cost Ratio	Impact of Conservation In Delaying System Capacity Expansion Schemes
			Capital	Operating		
Massachusetts Water Resources Authority	£89-396 million (1990)	£22.1 million (1986 budget)	£89-396 million (1990)	NA	> 4	Indefinite
New York City DEP	£1.9-2.8 million per Ml/d (1995)	£0.6-0.7 million per Ml/d, toilet rebate programme only (1994-1997 budget)	£1.3-2.0 million per Ml/d	£33 million/year	> 3	Indefinite (water supply), 10 years (wasteswater)
United Water/New York	£53.3 million (1996)	£0.82 million (actual 1993-1995)	£1.95 million (1990)	NA	> 2	5-6 years
Cape May Water & Sewer Utility	£3.3 (1996)	£33,300 (actual 1987-1995)	NA	£10,000 (City fixture replacements only)	> 2	3 years

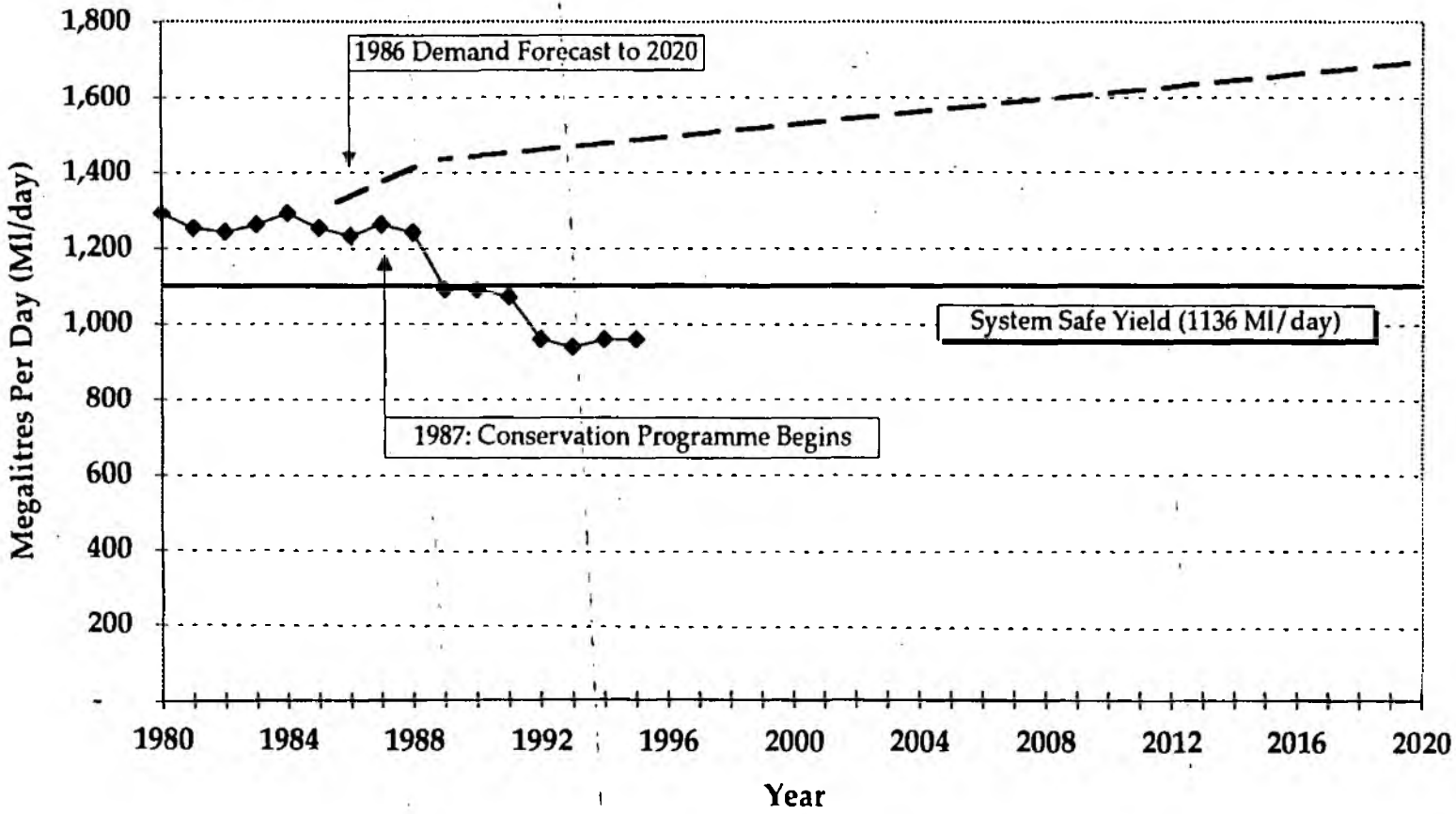
A. Massachusetts Water Resources Authority

Overview

- Wholesaler to 2.5 million population in Boston metro area
- Since 1960s, water demand projected to grow beyond 1136 Ml/day safe yield
- 1986 decision crisis: Invest £89-396 in new supply schemes or try conservation; Media reports Boston's 50% UFW
- 1986: NGOs win; Conservation planning process begins
- 1987-1993: est. £22+ conservation program implemented
- 1996: Water demands down by 23% since mid-1980s
- 1996: *Indefinite* delay in expanding system capacity
- Est. benefit-cost ratio: > 4

MASSACHUSETTS WATER RESOURCES AUTHORITY

ANNUAL AVERAGE WATER DEMAND, 1980 - 1995, Ml/day



Source: Massachusetts Water Resources Authority (1996)

A. Massachusetts Water Resources Authority

Highlights of Conservation Program

- UFW audits and reductions among 47 "contract communities" (retail utilities), Boston's UFW down to @25%
- 6-litre/flush toilets required by state plumbing code amendment
- 348,900 households have plumbing fixture retrofit kits installed directly by MWRA contractors (6-8% domestic indoor water use savings)
- 50,000 Public and low-income housing retrofits completed
- 100+ industrial-commerical-institutional customer water audits completed, est. 20-30% water savings per audit site
- Emphasis on hardware, not behavior-driven measures

A. Massachusetts Water Resources Authority

Assessment of Conservation Program

+ Water savings have exceeded expectations
+ MWRA now has supply surplus
+ Good (and continuing) public involvement of "stakeholders"
+ MWRA willing to share credit to get results
+ Programs well-designed, hardware approaches for long-term savings

– Conservation requirements for utility contract renewals could be tougher
– Not enough resources committed to ICI conservation potential
– Not enough focus on outdoor water use
– Program evaluation is weak, details of costs and benefits are difficult to discern
– "Every leak is economic to repair" argument may be faulty
– School program not well directed

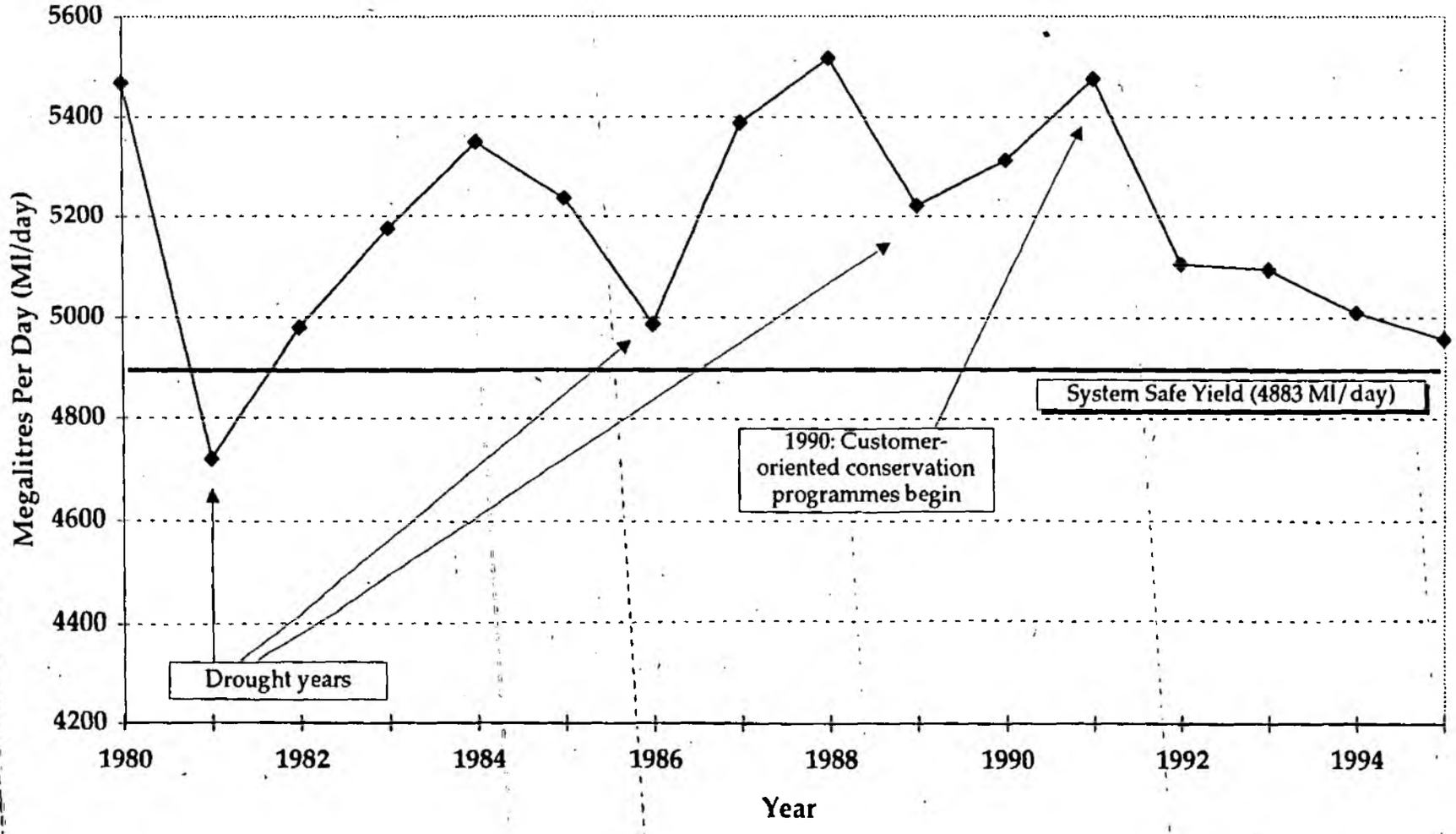
B. New York City Department of Environmental Protection

Overview

- Water supplier to 11 to 12 million people in NYC metro region
- For over 20 years, demand has typically exceeded safe yield (4883 Ml/day)
- Late 1980s: Supply expansion-or-conservation decision point
- …Universal metering and conservation strategies chosen over water supply and wastewater treatment expansion options
- 1994-1997: £166 million comitted to massive (over 1 million fixture replacements) 6-litre toilet rebate program
- 1995: Since 1991, demand reductions = 7.4%
- 1996: Indefinite delay in expanding water system capacity, 10-yr delay for wastewater treatment plant
- Est. benefit-cost ratio: > 3

NEW YORK CITY

ANNUAL AVERAGE WATER DEMAND, 1980 - 1995, Ml/day



Source: New York City Department of Environmental Protection (1996)

B. New York City DEP

Highlights of Conservation Program

- Universal metering (80% to date, 100% by 1998)
- Uniform tariff structure (for now)
- UFW reduction efforts enhanced
- Early 1990s: US and NYC 6-litre/flush toilets+ULVrequirements
- £166 million 6-litre toilet rebate program, 1-1.25 million fixture replacement goal (1994-1997)
- Domestic leak and retrofit fixture survey completed in 10,000 homes citywide
- Toilet replacements at @ 30,000 public housing units
- Customer service, "meter transition" and "bill capping" strategies
- Emphasis on hardware, not behavior-driven measures

B. New York City DEP

Assessment of Conservation Program

+ Water savings to date have resulted in indefinite delay in water supply expansion; 10-year delay in wastewater plant expansion
+ NYC now approaching safe yield
+ Strategic public outreach efforts for metering and conservation programs
+ NYC DEP willing to spend money, take risks and try creative approaches to reach goals that are cost-effective over the long-term
+ Emphasis on hardware approaches for long-term savings

– Needs more focus on industrial-commercial-institutional sector
– No benefit-cost analysis of *all* conservation options, not clear which are most cost-effective
– Lack of detailed monitoring of program results, not clear where savings are coming from

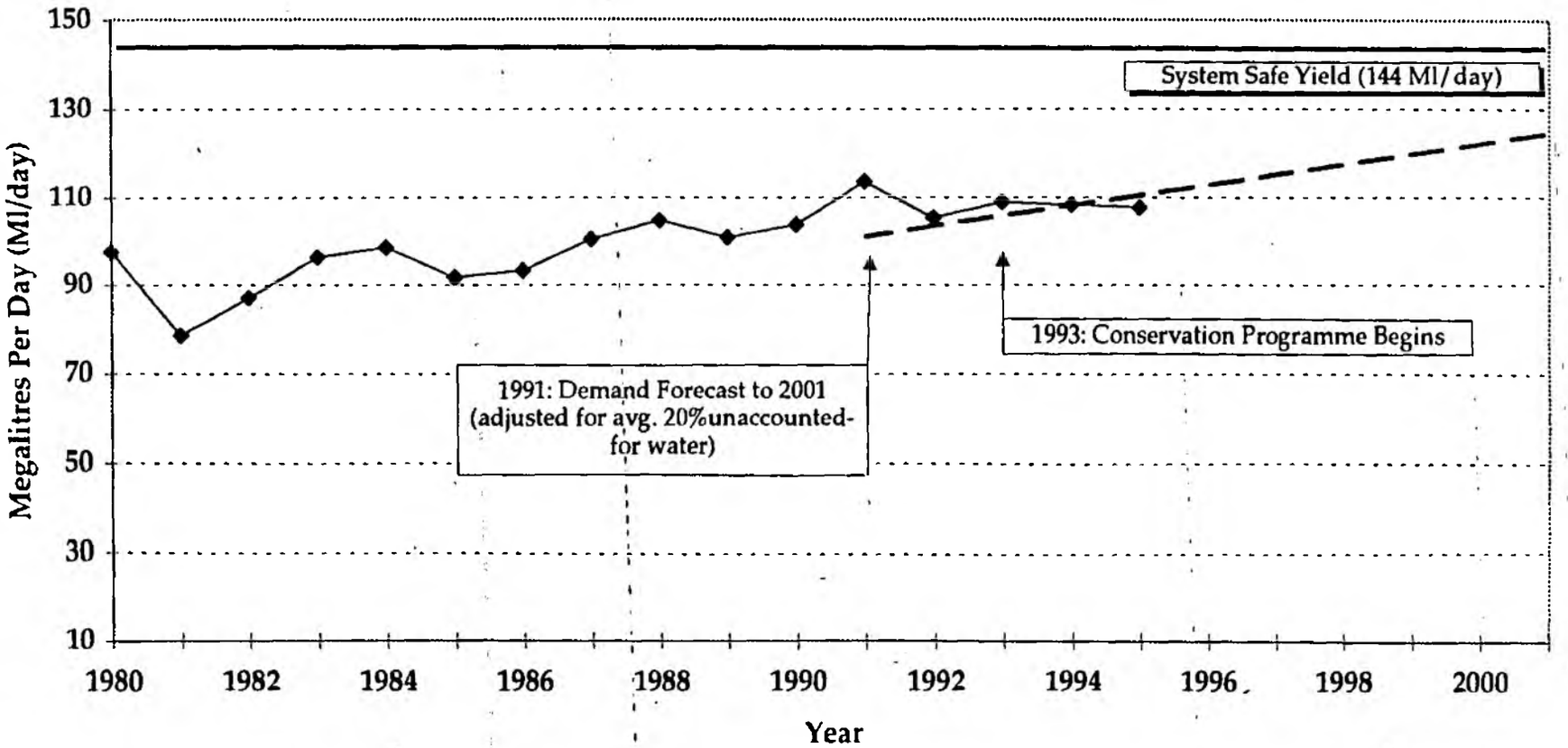
C. United Water/New York

Overview

- Water supplier to 230,000 pop. near NYC commuter belt
- Automatic Meter Reading (AMR) system
- Early 1980s: 50% summer tariff surcharge est. for high users
- 1988: Public Service Commission (regulator) orders study to determine if conservation could postpone &/or reduce cost for new water supply development needed by @ year 2000
- 1993: Revised conservation plan/programme begins
- 1993-1996: Water demands down by 6%
- 1996: 5-6 delay in expanding water system capacity
- Est. benefit-cost ratio: > 2

UNITED WATER COMPANY/NEW YORK

ANNUAL AVERAGE WATER DEMAND, 1980 - 1995, Ml/day



Source: United Water Company/New York (1996)

C. United Water/New York

Highlights of Conservation Program

- 50% summer use tariff surcharge
- UFW reduction, incl. 35% savings on treatment system backwash
- Customer education
- Early 1990s: US and state 6-litre/flush toilets+ULVrequirements
- ULV fixture retrofit kits ordered by about half (24,800) domestic customers
- "ET" garden watering advisory program and video
- Two meetings with non-domestic customers @ conservation
- Emphasis on behavior-driven incentives and voluntary-approach measures

C. United Water/New York

Assessment of Conservation Program

+ Water savings will result in 5-6 year delay of supply expansion
+ Peak demands reduced from high of (winter:summer) 1:1.8 to 1:1.5
+ Strong PR approaches
+ Customer-company relations improved, United "environmentally-friendly" persona is more established

– Incentive approaches over nuts-and-bolts measures
– Retrofit program results could be better
– Weak conservation program monitoring and evaluation
– Future conservation plans are minimal, despite avoided capital savings' benefits
– Involvement of PSC/Regulators are primary influences that drive conservation investments

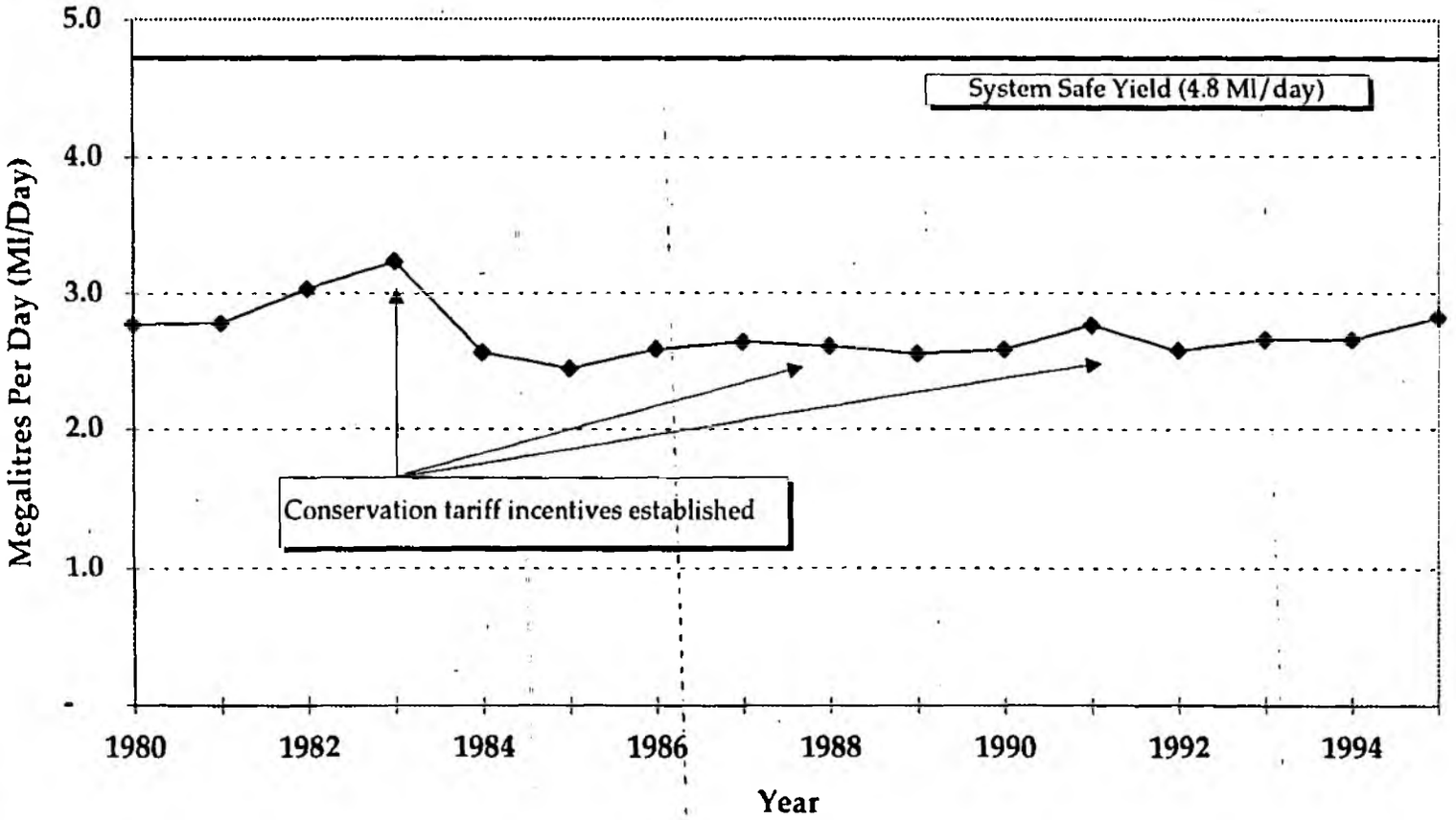
D. Cape May

Overview

- Retailer to tourist, seaside community (6,000 pop. winter, 50,000 in summer); Wholesaler to nearby Cape towns
- Early 1980s: Saltwater contamination of groundwater discovered, summer season overabstraction is the cause
- 1983: Peak season pricing tariff created to reduce summer use
- 1983-1996: Conservation incentives and measures implemented to slow saltwater intrusion, delay desal plant
- 1987-1996: *Projected* water demands down by 15-20%
- 1996: 3 year delay in desalination plant constuction
- Est. benefit-cost ratio: > 2

CAPE MAY

ANNUAL AVERAGE WATER DEMAND, 1980 - 1995, Ml/day



Source: City of Cape May Water & Sewer Utility (1996)

D. Cape May

Highlights of Conservation Program

- UFW reduction more aggressive, now looks for leaks
- Inclining, peak season tariff structure (2x winter)
- Public buildings metering and fixture replacement
- Public housing unit fixture replacement
- Domestic device retrofit kits sold at cost
- Commercial water audits
- Early 1990s: US and state 6-litre/flush toilets+ULVrequirements
- Local conservation ordinances
- Public eduction and community outreach
- Emphasis on behavior-driven incentives, some hardware measures

D. Cape May

Assessment of Conservation Program

+ Saltwater intrusion, desal plant delayed for 3 years
+ Water pricing signals are good, although they may wane over time
+ Strong commitment to conservation concepts and approaches
+ Good hardware measures in public buidlings and housing units
+ Source of supply protection efforts
+ Community involvement of stakeholders is encouraged

– System efficiency, UFW approaches and results are unclear
– Pricing incentives are not supported enough by hardware measures
– No measurable conservation goals
– Lack of rigorous planning and benefit-cost analysis of conservation options
– No enforcement of conservation ordinances
– Lack of regional support for conservation
– Great intentions, not-so-great strategic planning and action

3. Closing:

- Message #1
- Message #2
- Message #3

Three Messages

Message #1

Most US water supply systems have the potential to reduce water demand from ***10 to 25%*** by implementing a variety of conservation measures.

Message #2

By understanding and adhering to the *process* by which a conservation program needs to be developed, water saving goals can be realized in a cost-effective and timely manner.

Message #3

Successful conservation programs are born of several things, most importantly:

- Institutional support and commitment of resources from "cradle to grave"
- Involvement of "vested stakeholders"
- Adherence to a comprehensive planning and implementation process
- Common-sense approaches
- A proactive attitude and willingness to take risks!

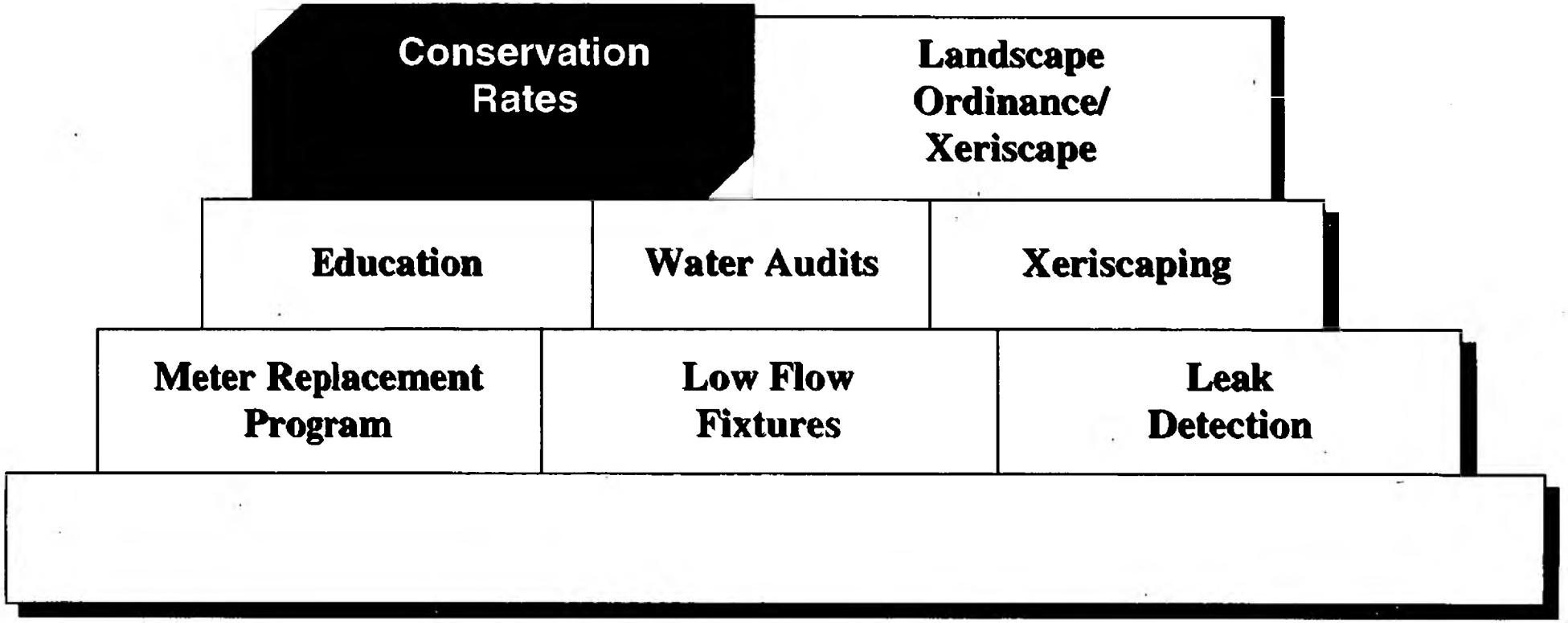
Water Conservation Planning in the USA

Conservation Policy Issues

Friday, 14 June 1996

RAFTELIS ENVIRONMENTAL
CONSULTING GROUP, INC.

Conservation Program Elements



Benefits of Conservation Rates

Preservation of water resources

Promoting efficient use of water resources

Rewarding efficient water users

Shifting water demand to desired periods of the day, month, or year

Surcharging water customers for discretionary or excessive use

Objections to Conservation Rates

- Difficulties in applying conservation rates across all user classes
- Potential inconsistency with "cost of service" principles
- Difficulties in predicting customer demand
- Legal difficulties with conservation rate methodologies
- Potential instability of revenues
- Possible negative impacts on various classes of customers

Features of Conservation Pricing Systems

- Water Usage to be Metered
- Customer Bill Communicated in Timely Fashion
- Water Bill Not Combined with Other Utility Charges
- Wise Water Use Rewarded
- Inefficient Water Use Surcharged

Converting To Metered Use In UK

- Conservation Focused
- Cost of Service and Equity Focused
- Implementation Issues
  - Conversion of Billing Systems
  - Initial Impact on Customers
  - Impact on Revenues

Protecting the Residential Customer Through Conservation Pricing

- Explore Tariff Structures That Protect Charges for Essential Use
- Empower Customers to Control their Water Bills
- Transfer Cost Burden to High Outdoor Water Users (Garden Watering, Lawn Irrigation, Etc.)
- Ensure Conservation Rate Structure Translates Into Lower Water Bills for Wise Water Users

Protecting the Stability of Revenues

- Evaluate Historical Customer Usage and Pricing Response
  - Utility Providing Service
  - Proxy Utilities
  - Authoritative Studies
- Perform Tariff and Revenue Sensitivity Analysis
- Establish Revenue Stabilization Funds
- Maintain Flexible Pricing Structure

Rate Evaluation Matrix

Conservation Pricing Objectives	Existing Structure	Moderate Conservation Structure *	Aggressive Conservation Structure *
Reduce System Demand (Resource Preservation)	S	G-	E-
Reduce Peak Usage	S-	G-	E-
Enhance Public Utility Image of Conservation Consciousness			
Reward Efficient Water User/Surcharge	S+	G-	E-
Discourage Nonessential Water User (Economic Equity)	S	G+	E-

* Excess Use Rate Structure

Key: Excellent=E
Good=G
Satisfactory=S
Poor=P

Appendix

Advantages and Disadvantages of Alternative Conservation Rate Structures

Conservation Rate	Advantages	Disadvantages
Uniform Rates	Are simply designed. Are understandable and accepted by most customers. Can be useful as a transition to a more aggressive conservation rate structure. Are generally easy to implement, administer, and update. Are growing in popularity.	May be inconsistent with cost of service characteristics among classes of customers. May only marginally achieve conservation objectives. May have substantial economic impact on large volume users when changing from a declining block rate structure.
Inverted Block Rates (Excess Use Rates)	Can be highly conservation oriented. Are growing in popularity, particularly in water scare areas such as the Southwest, Florida, and resort areas. Can be structured to reflect attributes of marginal cost pricing. Are generally understandable by customers. Can generate surpluses of revenue as a rate stabilization mechanism or other funding source.	May be inconsistent with cost of service rates. Are more apt to lead to revenue instability than traditional methodologies. May be complicated to implement if existing rate structure does not allow for simple conversion to inverted rates. May pose difficulties in developing appropriate block cutoffs and unit rates. May not be legal in some states. May have substantial impact on high volume users when moving from another rate structure.

Advantages and Disadvantages of Alternative Conservation Rate Structures

Conservation Rate	Advantages	Disadvantages
SeasonalRates	Are strongly conservation oriented by efficiently using facilities during the season and non-season. Are increasingly popular in areas where the difference between average and maximum day demands are significant. Are generally understandable and accepted by customers. Are based upon cost of service allocation concepts. Are generally consistent with legal requirements in most jurisdictions.	Are sensitive to differences in climatic conditions between the season and non-season. Are highly dependent upon frequency of billing cycle. May have less predictable impact on demand and, therefore, revenue. May have substantial impact on high volume customers when moving from another rate structure.
Marginal Cost Rates	Can be more financially sufficient than "average cost" rates. Can promote water conservation efficiency objectives. Can be designed to "reward" efficient water users. Can provide source of funding for water conservation programs or rate stabilization fund. May be very simply designed.	May have less predictable impact on demand and, therefore, on revenue. May be difficult to develop, explain, and understand. Are untested legally in many states. May have significant impact on high volume users within customer classes. May generate large surpluses which may be legally disallowed.

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Suggested Framework for UK Water Conservation Planning

Dr. David Howarth
Environment Agency

USA Water Conservation Manuals

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- Before The Well Runs Dry - AWWA 1984
  'A Handbook for Designing a Local Water Conservation Plan'
- Water Conservation - William Maddeus 1987
- Evaluating Urban Water Conservation Programs:
  A Procedures Manual.
  Californian Urban Water Agencies. 1993
- The Water Conservation Manager's Guide to Residential Retrofit. AWWA 1993

Step 1

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Establish Policy and Planning Framework

Main Responsibilities and Interests

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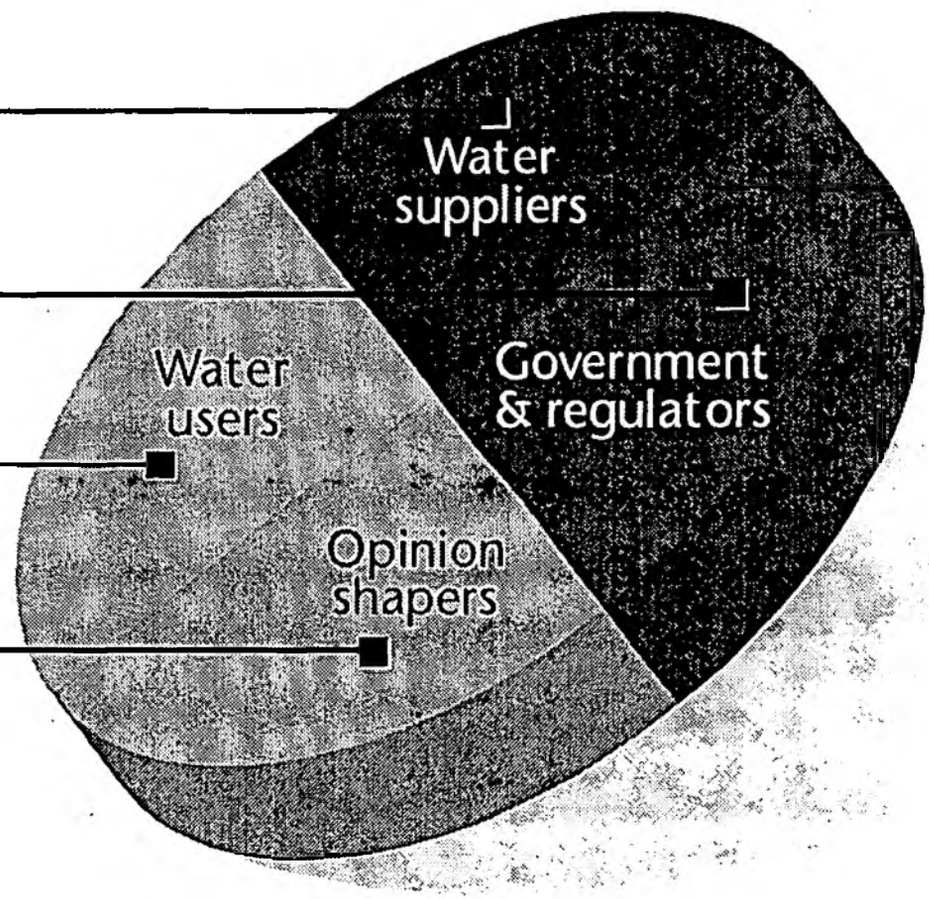
Water Companies
WSA/WCA

DoE/WO, OFWAT
NRA/EA, MAFF, DTI

Household customers
Industrial customers

e.g. CPRE
FoE, CBI, NFU



Step 2 - Define Conservation Goals

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- Peak or average?
- High or low percentage reduction?
- Short or long term?
- System wide or concentrated?
- Involving/not involving the customer?

Step 3 - Build Support

Public Involvement: How?

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- OFWAT CSC's
- Public Water Council (Yorkshire Water)
- Public meetings/public forums
- Community representatives on Company advisory committee?

Step 4

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Water Demand Analysis

Components of The Public Water Supply System (By Volume)

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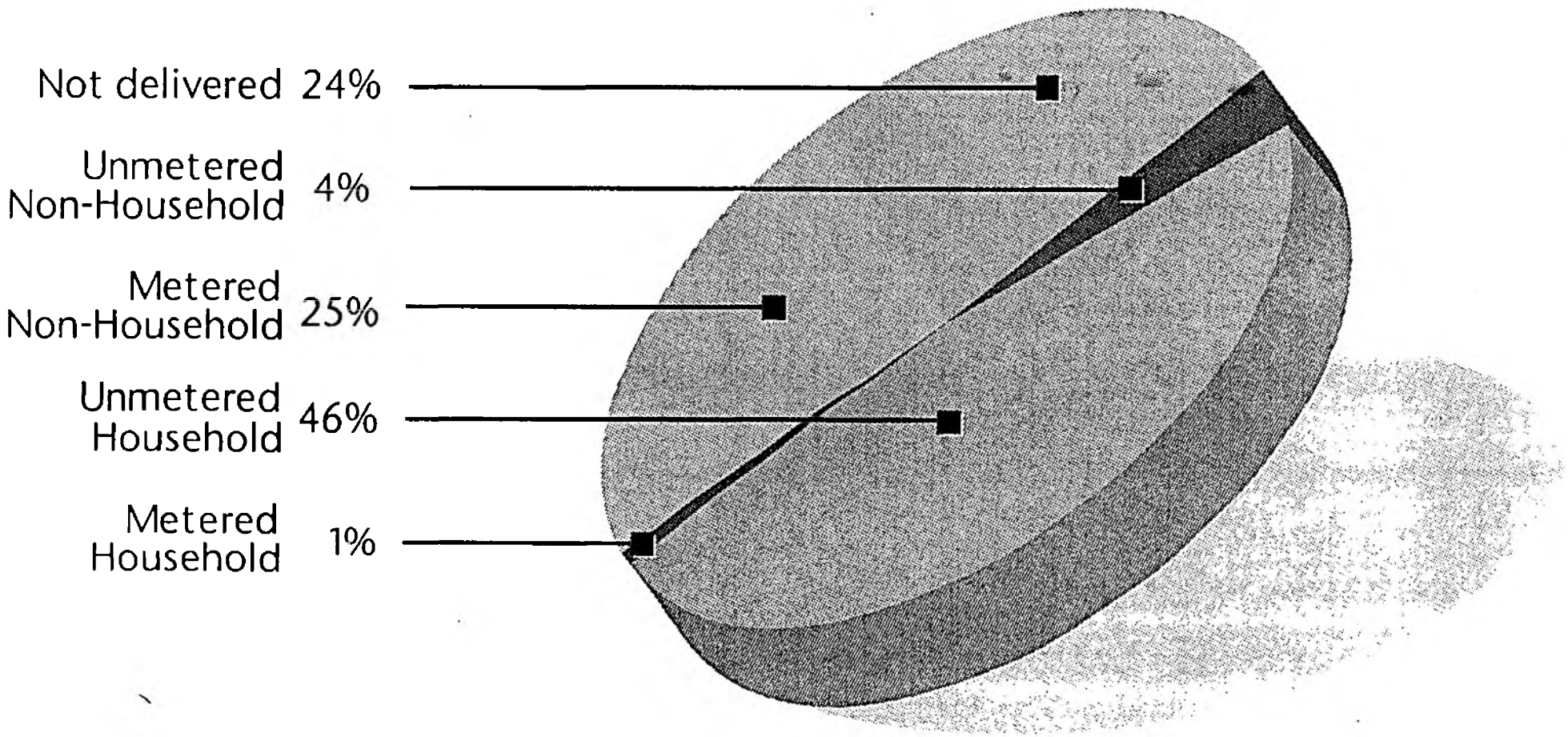

Household Use (By Volume)

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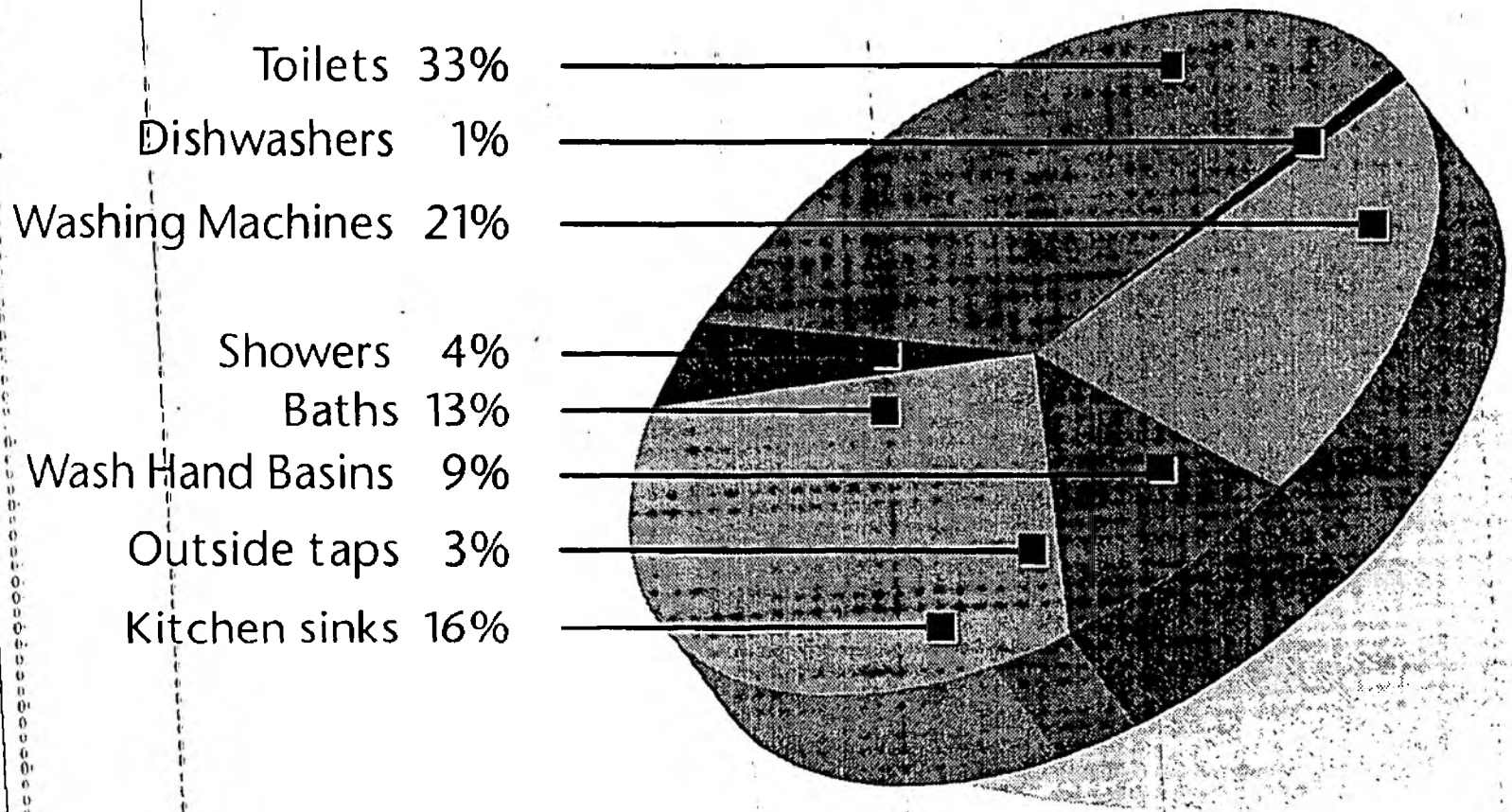

From Anglian Water's SODCON Study

Step 5 - Identify Conservation Measures and Incentives

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	Short Term	Long Term	Peak	Avge	Low	High
Incentives						
• Metering, tariffs	✓	✓	✓	✓	✓	✓
• Education	✓	✓	✓	✓		✓
• Restrictions	✓		✓	✓		✓
Measures						
• Low flush WC's		✓		✓		✓
• Leakage control		✓		✓		✓
• Efficient washing machines		✓		✓	✓	
• Greywater recycling		✓	✓	✓		✓

Step 6 - Cost Benefit Analysis

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- Capital costs
- Operational costs
- Environmental costs and benefits
- Social costs and benefits

Impacts of Demand Management Programs for an Investor Owned Utility

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Social/Political	Pricing	Regulation	Education
Community lifestyle maintained	●	●	●
Community water related recreation may be jeopardised	●	●	●
Peer pressure to comply with program		●	●
Regulatory board opposition to program	●		
User and special interest group opposition to program	●	●	
Political opposition to program	●	●	
Fairness of plan must be carefully considered	●	●	
Program may affect politics of community growth and development	●	●	
User and political co-operation with program and understanding of utility operations increased			●
Co-operation with enforcement authority to implement program may be difficult		●	
Co-operation with school department and other community departments to incorporate program may be difficult			●
Well received by users and local government			●

Step 7 - Plan Development

Options, Budget, Schedule

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- Community representatives
- Regulators
- Media
- Formally present final plan to public

Step 8 - Program Implementation

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- Outreach
- Implement to agreed timescale and budget

Step 9 - Program Monitoring and Evaluation

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- Are costs as predicted?
- Are savings being realised?
- Is the program on schedule?
- Modify as necessary but consult
- Has the goal been achieved?

Suggested Framework For UK Water Conservation Planning

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