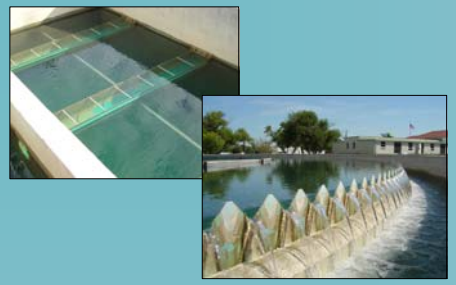

Economic Implications of Conventional Water Treatment Versus Desalination: A Dual Case Study

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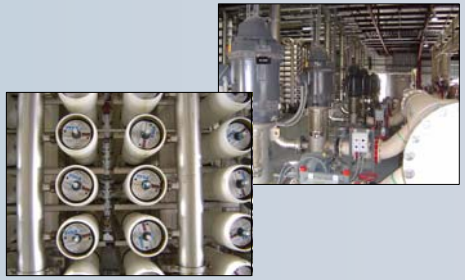

Introduction

- The Texas Lower Rio Grande Valley is experiencing rapid population growth, urban sprawl, and limited water resources.
- Increased competition for water has urban planners evaluating alternatives for future potable water supplies.
- Currently, the majority (87%) of the region's Municipal and Industrial water comes from conventional treatment of Rio Grande surface water.
- Historically, desalination of brackish groundwater has not been economically feasible, but technological advancements warrant a new comparative analysis.

Objectives

- Provide a comprehensive economic and financial analysis of the life-cycle costs of producing potable water for conventional surface-water treatment and brackish groundwater desalination.
- Assist in regional water planning and education of local and state stakeholders.

Methodology

- Combines standard Capital Budgeting-Net Present Value (NPV) analysis with the calculation of annuity equivalents.
- Calculating NPV values of dollars and water allows for comparing alternatives with differing annual cash flows and water production output, while the use of annuity equivalents facilitates comparisons of projects with different useful lives.
- The combined approach integrates expected years of useful life with related annual costs and outputs, as well as other financial realities, into a single comparative, comprehensive annual $/ac-ft {or $/1,000 gals} life-cycle cost.
- Calculations employ an annual discount rate of 6.125% to account for inflation and the time value of money. Included in this is an annual inflation rate of 2.04% and a discount factor of 4.00% to account for social-time preference. Risk is ignored due to the government-entity aspect of the decision.

Models

- Texas AgriLife Extension Service and Texas AgriLife Research agricultural economists developed two independent Microsoft® Excel® spreadsheet models:
  - CITY H_2O ECONOMICS© calculates life-cycle costs of potable water production for conventional treatment.
  - DESAL ECONOMICS© calculates life-cycle costs of potable water production for desalination.

Data

- Conventional Surface-Water Facility is McAllen Northwest, source water-Rio Grande surface-water:
  - Began operations in 2004, and is currently operating at 6.435 mgd which is 78% of the maximum designed capacity of 8.25 mgd. A projected useful life of 50 years is assumed.
- Brackish Groundwater Desalination Facility is Southmost, source water-Gulf Coast aquifer:
  - Began operations in 2002, and is currently operating at 5.1 mgd which is 68% of the maximum designed capacity of 7.5 mgd. A projected useful life of 50 years is assumed.

Cost Data for McAllen Northwest and Southmost Facilities (in 2006 dollars)

Cost Item	McAllen Northwest (Conventional)	Southmost (Desalination)
Water Rights Purchase	$20,404,541	NA
Initial Construction	$22,964,116	$26,190,993
Annual Continued Costs	$1,766,923	$1,725,101

Capital Replacement Items for McAllen Northwest and Southmost Facilities (in 2006 dollars)

Capital Item	Replacement Occurrence	Cost per Item	No. of Items Replace each Occurrence
McAllen Northwest (Conventional)			
-Anthracite	2 years	$15,000	1
-Chemical Feed Pumps	5 years	$3,750	4
-High Speed Pump	18 years	$45,000	3
-SCADA upgrades	5 years	$75,000	1
-Turbidity Meters	6 years	$25,000	6
Southmost (Desalination)			
-Well pumps	3 years	$10,000	20
-Membranes	6 years	$700,000	1

Results

- Baseline results indicate Northwest's life-cycle cost of producing potable water to be $771.67 per ac-ft {$2.37 per 1,000 gallons} (basis 2006 dollars).
- Baseline results indicate Southmost's life-cycle cost of producing potable water to be $769.62 per ac-ft {$2.36 per 1,000 gallons} (basis 2006 dollars).

Cost Results for McAllen Northwest Conventional Facility

Results	Units	Nominal Value	Real Value
NPV of Costs	2006 dollars	$207,706,012	$79,368,658
-Annuity equivalent	$/year		$5,079,864
NPV of Water Production	ac-ft	360,406	143,164
-Annuity equivalent	ac-ft/year		6,583
NPV of Water Production	1,000 gal	117,438,750	46,650,165
-Annuity equivalent	1,000 gal/year		2,145,074
Cost of Producing Water	$/ac-ft/year		$771.67
Cost of Producing Water	$/1,000 gal/year		$2.3682

Cost Results for Southmost Groundwater Desalination Facility

Results	Units	Nominal Value	Real Value
NPV of Costs	2006 dollars	$195,914,480	$65,281,089
-Annuity equivalent	$/year		$4,201,075
NPV of Water Production	ac-ft	291,341	118,745
-Annuity equivalent	ac-ft/year		5,460
NPV of Water Production	1,000 gal	94,936,500	38,693,220
-Annuity equivalent	1,000 gal/year		1,779,196
Cost of Producing Water	$/ac-ft/year		$769.62
Cost of Producing Water	$/1,000 gal/year		$2.3619

Conclusions

- These case studies suggest the life-cycle costs of producing potable water are virtually equivalent for groundwater desalination and conventional treatment.
- There are other factors that must be taken into account when comparing the two technologies such as quality of water, operation efficiency, energy, labor rates, input costs, disposal of brine, drinking water standards, and source water.

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