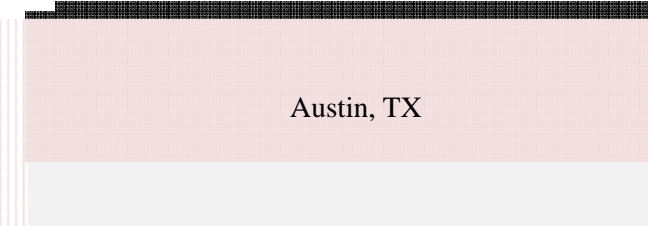


Currently, Dr. Rebello oversees a broader portfolio of programs focused on the data center and the high tech sectors, wastewater treatment, hospitals, campus housing and on-bill financing to name a few. In addition to sector-focused energy efficiency programs, QuEST also manages some of the largest local government partnerships totaling some \$15M dollars. These partnerships leverage the resources and outreach of cities and non-profit groups to increase energy-efficiency for their constituents.

Dr. Rebello's Ph.D. is in Economics from the University of Washington where his dissertation focused on the inter-temporal adjustment to residential time-of-use rates.

Electric Utility Marketing Managers of Texas



Austin, TX

Data Center Optimization

Review of Current Program Results

Derrick Rebello - President
QuEST



About QuEST

- Energy Efficiency Management and Engineering Firm Offering a Full suite of services
 - Turn-key energy efficiency program management
 - Engineering services from design to construction management
 - Consulting for LEED, Energy Star, and carbon footprint
- QuEST currently manages broad portfolio of energy efficiency initiatives (+\$30M in program funds)
 - Local Government Partnerships
 - Sector-focused programs (Data Centers, Wastewater, Hospitals, Hotels, Campus Housing)
 - Retro-commissioning
 - On-Bill Financing



Data Center Characterization

- Data centers and labs are among the most energy intensive operations
- Typical data centers with state of the art rack systems are 15 times more energy intensive than commercial buildings
- Data centers operate 24/7
- Data centers are everywhere from large co-location facilities to former “phone” closets
- Most data centers and labs are not moving to the Columbia River Gorge or to a Midwest coal plant
- EPA estimates data centers represent about than 1.5 - 3 percent of national energy consumption - and it's growing.



Data Center Control Program

- Objective is to optimize air management through better monitoring and improved controls
- Savings opportunities
 - Use of hot aisle/cold aisle configuration
 - Use of air-side economizers (3000+ hours)
 - Installing VFD on Computer Room Air Conditioning (CRAC) Units
 - Use of better cooling parameters
- Offers audits and incentives for equipment (wireless controls and CRAC-unit VFD) and better practices (air-side economizing and improved air management)



DCCP Economics

- Estimated cost-effectiveness (PAC-levelized) costs \$0.038/kWh based upon PG&E commodity costs.
- Estimated first year costs \$0.19/kWh
- Program currently structured as performance-based third party agreement
- Incentives currently targeted at \$0.11/kWh and covers installation costs in addition to equipment.



DCCP Results

Data Center	Square Footage	Gross kWh	Savings/Sqft
1	38,000	1,635,069	43.03
2	6,000	320,619	53.44
3	6,300	322,541	51.20
4	9,780	144,049	14.73
5	12,825	130,533	10.18
6	10,000	162,416	16.24
7	6,000	864,842	144.14
8	14,200	698,935	49.22
9	9,534	536,633	56.29
10	3,386	114,156	33.71
11	3,800	201,000	52.89
12	10,805	1,250,000	115.69
13	11,000	660,000	60.00
14	63,700	1,800,906	28.27
	205,330	8,841,699	43.06
Goal	6,384,198		
% Goal	138%		



Market Potential

- Current estimates of 1.5 to 3 percent of total energy consumption
- Given the number of tech and Fortune 500 firms in Texas, consumption likely on the higher end
- Factors that can decrease potential
 - Improved efficiency of future servers
 - Better advances in management software (virtualization 1.0 & 2.0)
- Factors that can increase potential
 - Continued growth of storage needs
 - Continued push for paperless interactions
 - Demand for more digital-media



Roots of Success

- Global warming
- Word of mouth
- Continued dissemination of current research by LBNL
- Leadership by many of top tech firms
- Simplicity - Turn-key - Flexibility
 - If incentives can cover entire project costs, why not?
 - Turn-key installation can reduce implementation time
 - Project management assistance



Market Transformation Timeline

- Data centers are being designed and built for higher efficiency
- But, first cost rules continue to apply
- How long until the existing data center market is transformed?
- Tech sector data centers will be transformed before non-tech sector



Questions?

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