

Distribution Costs Studies for Distributed Generation

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What We Looked At

- Distribution Plant

 - ❖ Lines & Feeders

 - ◆ Plant Investment

 - ◆ O&M

 - ❖ Transformers & Substations

 - ◆ Plant Investment

 - ◆ O&M

- Embedded and Marginal

- FERC Form 1 Database 1994-1999

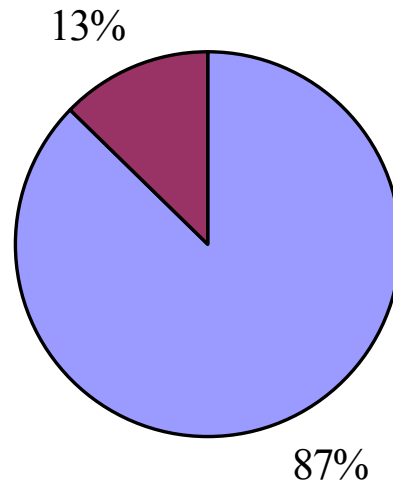


General Observations

- On Average Marginal Costs Are 135% of Embedded Costs
- Average Annual Investment of 124 Utilities
 - ❖ Lines & Feeders -- >\$5.6 billion
 - ❖ Transformers & Substation -- >\$800 million
- Costs Highly Dependent on Geographic Location Within Each Utility

Where New Distribution Investment Money Goes

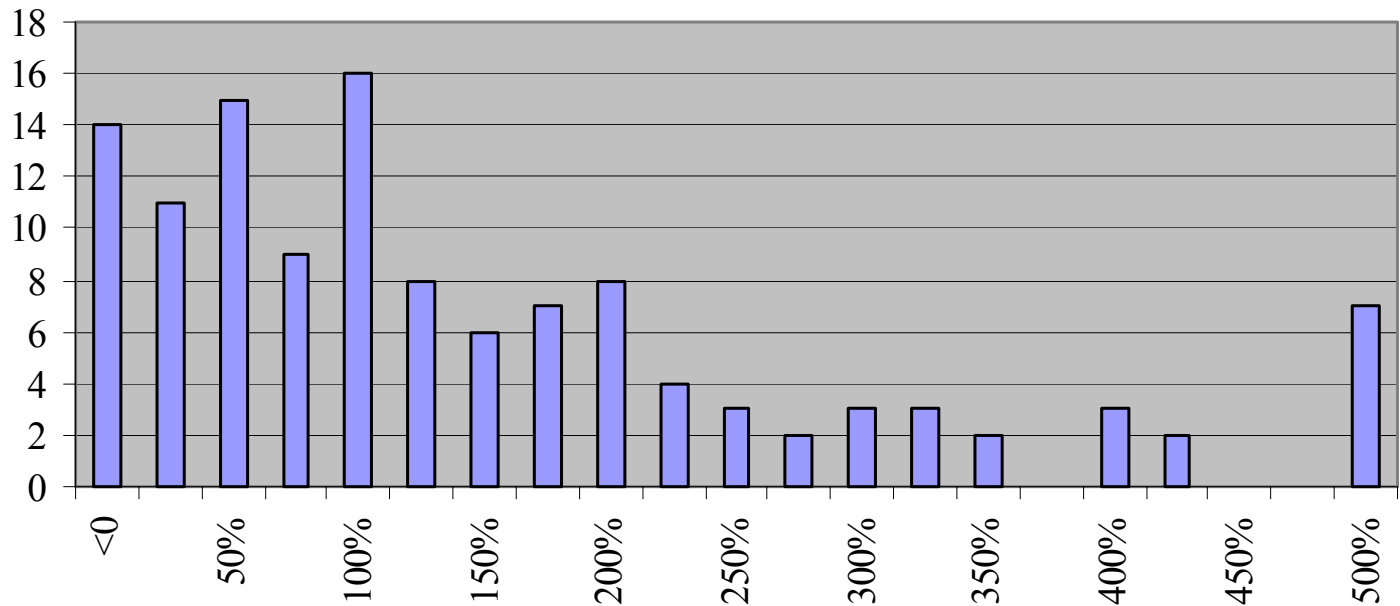
Marginal Distribution Plant Investment



■ Lines & Feeders Plant ■ Transformers & Substations Plant

Marginal vs. Embedded Costs

**Distribution of Percentage By Which Marginal
Investment Per MW Exceeds
Embedded Investment Per MW for Line & Feeders
(1995-1999)**



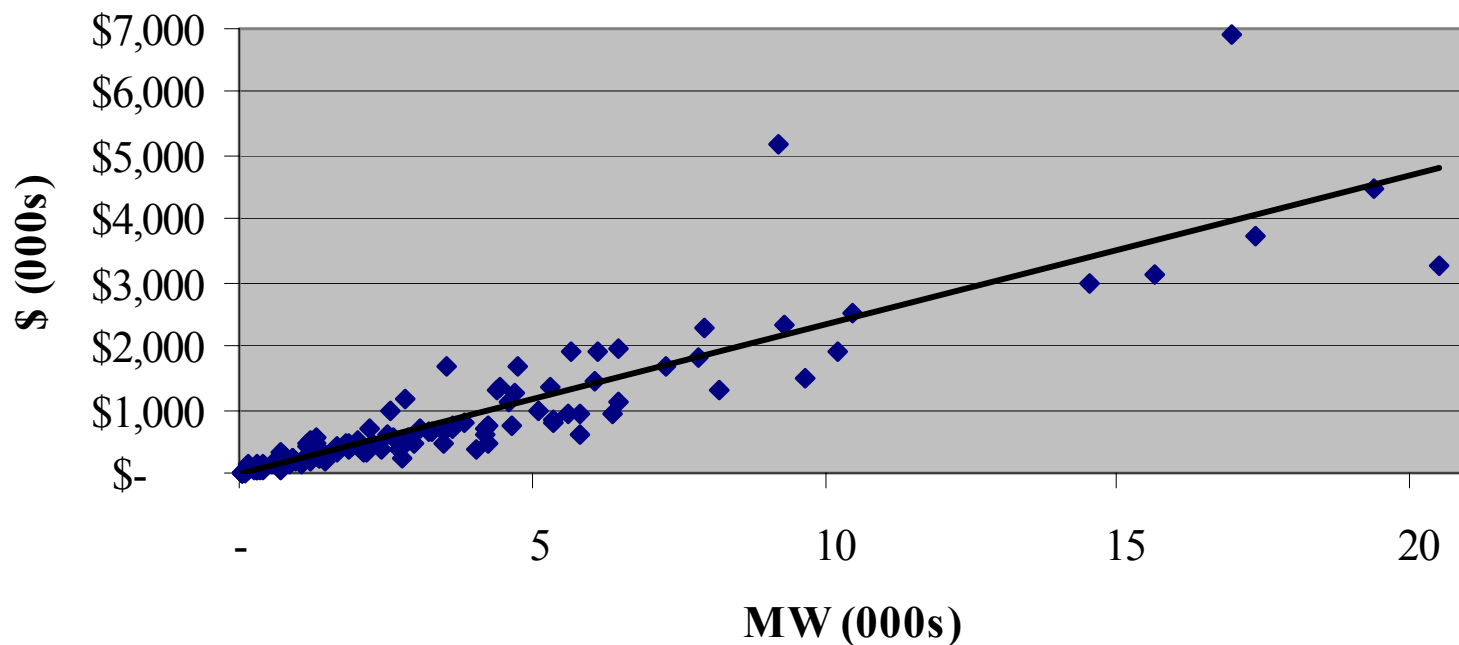


Lines & Feeders Plant Per MW of System Peak

Rank	Company	Lines & Feeders Plant Investment Per System Peak
1	New Hampshire Electric Cooperative, Inc.	\$732,359
2	Consolidated Edison Company of New York, Inc.	\$561,676
3	San Diego Gas & Electric Company	\$473,140
4	Commonwealth Electric Company	\$443,330
5	BANGOR HYDRO-ELECTRIC COMPANY	\$440,338
	Average	\$237,644
120	Ohio Power Company	\$108,150
121	Lockhart Power Company	\$102,673
122	Southwestern Public Service Company	\$91,505
123	Northwestern Public Service	\$88,950
124	Northern States Power Company (Wisconsin)	\$79,787
Statistical Summary		
	Standard Deviation	\$100,906
	Average	\$237,644
	Correlation	0.89
	Average Plus Standard Deviation	\$338,551
	Average Less Standard Deviation	\$136,738

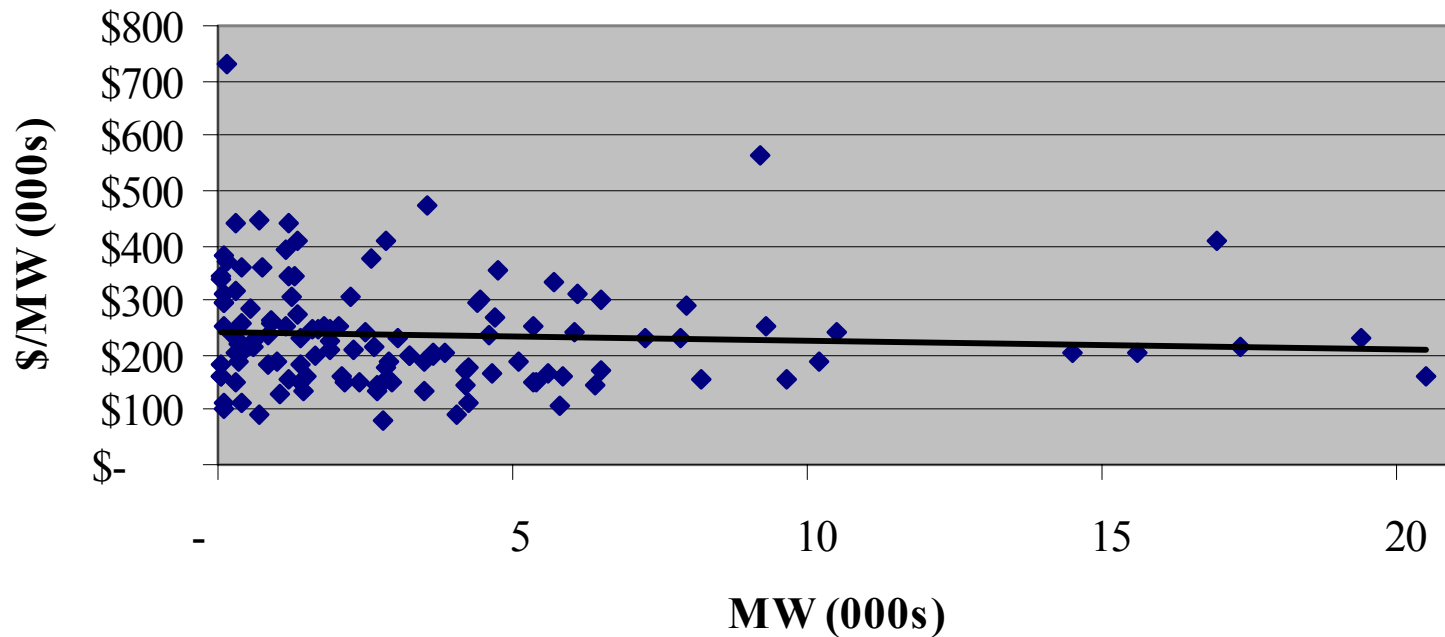
Lines & Feeders Plant Per MW of System Peak

**Lines & Feeders Plant Investment
vs. System Peak
(5 Yr. Average 1995-1999)**



No Economies of Scale for Larger Utilities

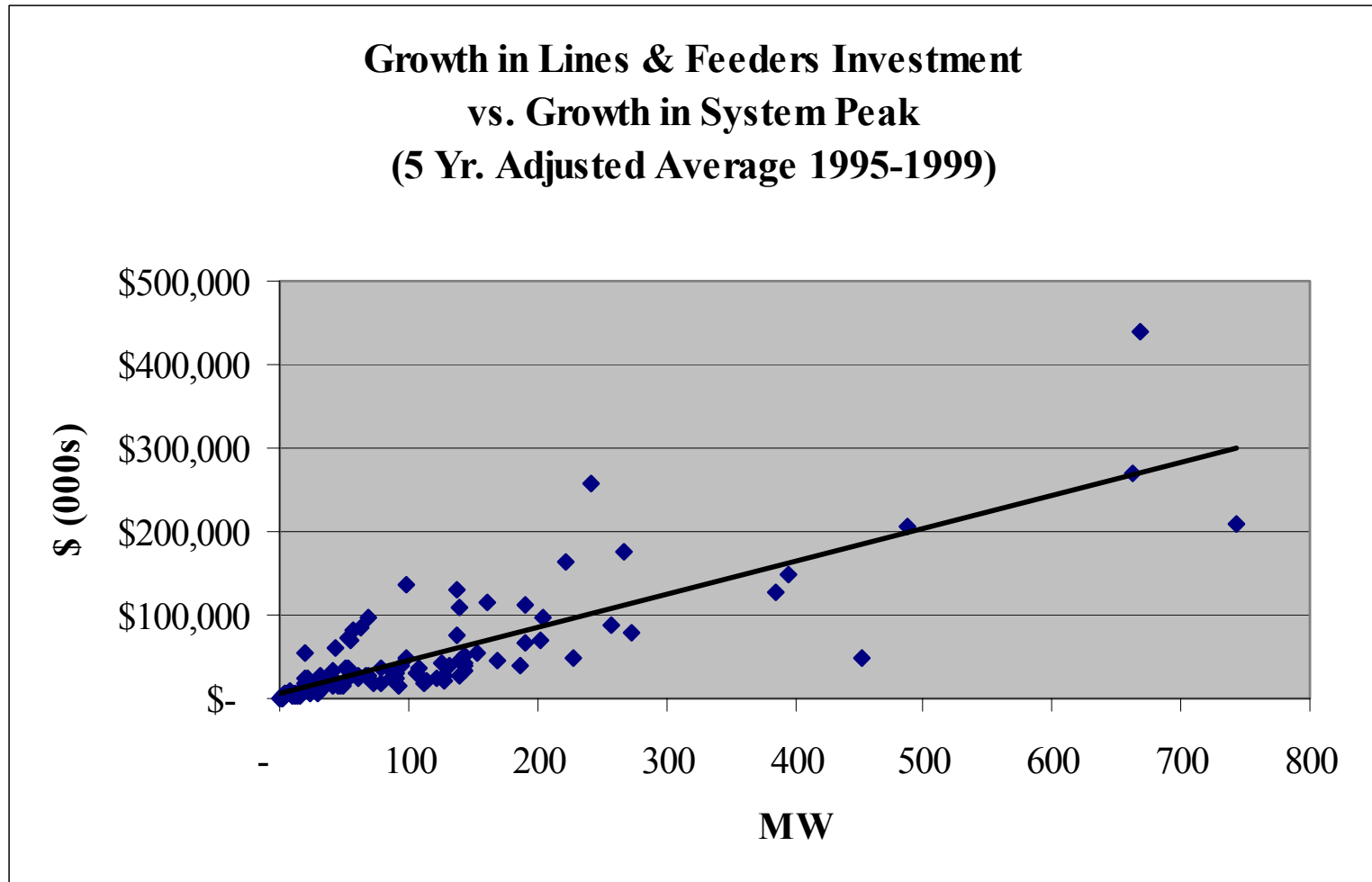
**Lines & Feeders Plant Investment Per MW
vs. System Peak
(5 Yr. Average 1995-1999)**



Growth in Lines & Feeders Plant vs. Growth in System Peak

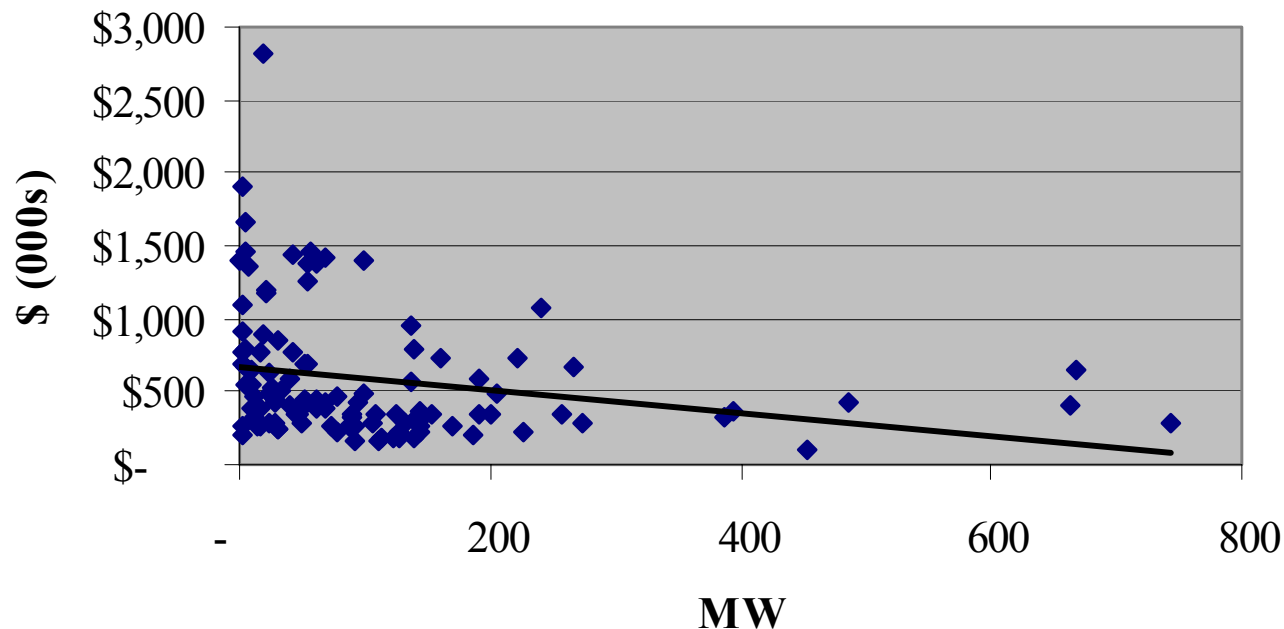
Rank	Company	Growth in Lines & Feeders Plant Investment Per Growth in System Peak
1	THE POTOMAC EDISON COMPANY	\$19,483,006
2	New Hampshire Electric Cooperative, Inc.	\$7,130,319
3	Central Vermont Public Service Corporation	\$6,474,471
4	Pennsylvania Electric Company	\$2,815,919
5	Upper Peninsula Power Company	\$1,902,999
	Average	\$608,215
107	Western Resources, Inc.	\$184,459
108	Entergy Mississippi, Inc.	\$174,603
109	Toledo Edison Company, The	\$163,059
110	Kansas Gas and Electric Company	\$155,231
111	Entergy Arkansas, Inc.	\$108,886
Statistical Summary†		
	Standard Deviation	\$447,964
	Average	\$589,524
	Correlation	0.83
	Average Plus Standard Deviation	\$1,037,488
	Average Less Standard Deviation	\$141,559

Growth in Lines & Feeders Plant vs. Growth in System Peak



No Economies of Scale For Faster Growing Utilities

**Growth in Lines & Feeders Plant Per Growth in System Peak vs.
Growth in System Peak
(5 Yr. Adjusted Average 1995-1999)**





A Western High Cost Utility: PacifiCorp

Value of Project Deferring DR (\$/kW)

Company

PacifiCorp

Marginal \$/MW	Transformers &		Lines & Feeders	
	\$65,708	\$484,057	\$87,757	\$2,699,159
Deferral Years	Case		Case	
	Low	High	Low	High
1	\$ 7.96	\$ 58.67	\$ 10.64	\$ 327.17
5	\$ 32.87	\$ 242.13	\$ 43.90	\$ 1,350.13
10	\$ 50.81	\$ 374.33	\$ 67.87	\$ 2,087.32
15	\$ 60.28	\$ 444.05	\$ 80.51	\$ 2,476.09
25	\$ 67.47	\$ 497.01	\$ 90.12	\$ 2,771.40
30	\$ 68.53	\$ 504.82	\$ 91.53	\$ 2,814.95



A Western Low Cost Utility: Public Service Colorado

Value of Project Deferring DR (\$/kW)

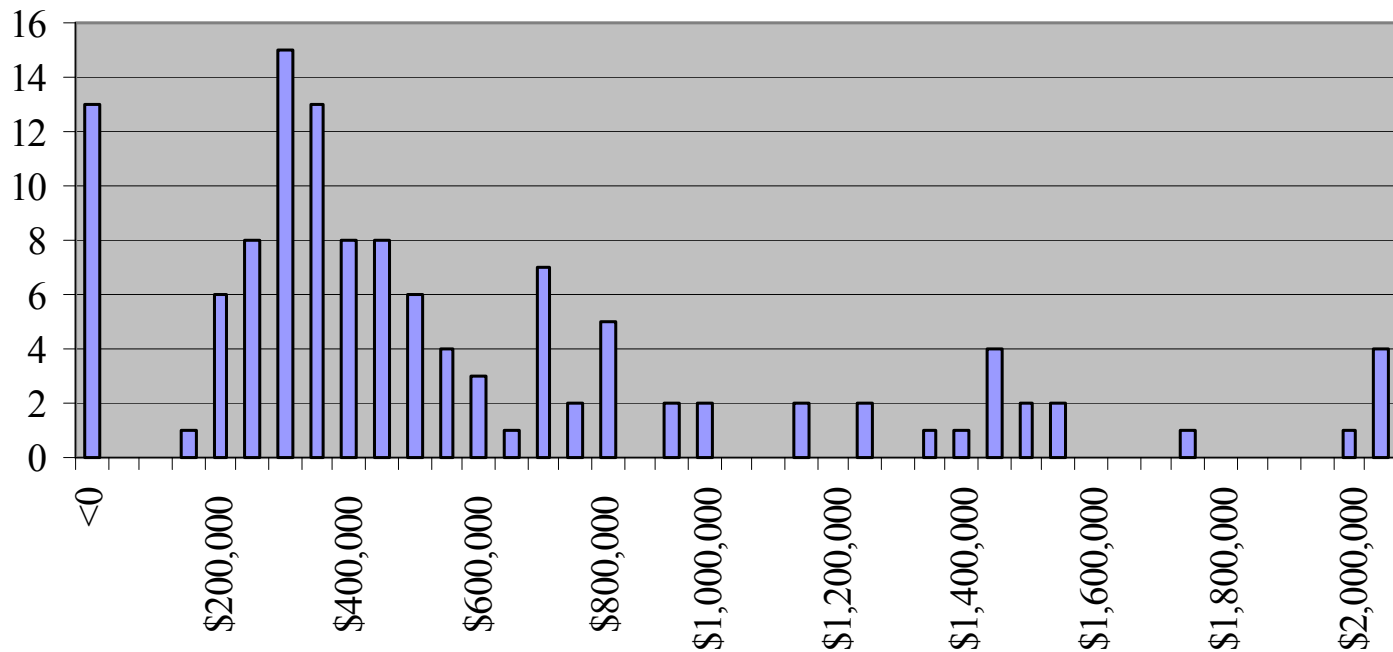
Company

Public Service Company of Colorado

Marginal \$/MW	Transformers &		Lines & Feeders	
	\$20,911	\$154,045	\$21,906	\$673,758
Deferral Years	Case		Case	
	Low	High	Low	High
1	\$ 2.53	\$ 18.67	\$ 2.66	\$ 81.67
5	\$ 10.46	\$ 77.05	\$ 10.96	\$ 337.02
10	\$ 16.17	\$ 119.13	\$ 16.95	\$ 521.04
15	\$ 19.18	\$ 141.31	\$ 20.11	\$ 618.08
25	\$ 21.47	\$ 158.17	\$ 22.50	\$ 691.80
30	\$ 21.81	\$ 160.65	\$ 22.86	\$ 702.67

Distribution of Marginal Costs: Lines & Feeders Per MW

**Distribution of Growth in Lines & Feeders Investment
Per Growth in System Peak
(1995-1999)**





Conclusions

- High Variability of Costs Among Utilities
- High Variability of Costs Within Utilities
- Most New Investment is in Lines & Feeders
- Significant Dollars At Stake
 - ❖ For 124 Utilities over \$6.4 Billion Invested Per Year
 - ❖ Equals Approximately \$1.2 Billions in Revenue Requirements *Increase* Per Year
- Significant Opportunities for DR Options