

## **B. Collections of Information Employing Statistical Methods**

1. To collect this information, TVA employs a telephone survey of residential households residing in the service area of one of the 159 Distributors that purchase power from TVA. Only households occupying the residence at which they are reached for three or more months are included in the sample. This survey is conducted as an independent measure of indirect program impact, effectiveness of communication efforts, evolving household demographics, *energy right* program administration, changes in the saturation of non-electric fuels, potential interest in energy efficiency, drivers of energy efficiency, and changes in saturation of electrical equipment. This information is not available from other public sources and must be gathered by TVA. The results of this survey aid groups such as TVA's Power Resource and Operations Planning as well as Residential Products and Services managers in assessing the effectiveness of TVA's Residential Programs, planning improvements to existing programs, and designing new programs. Distributors' staffs also use these results to determine ways to better meet the needs of their residential customers.

The respondent universe is comprised of all residential households residing in the TVA service area. From this universe, sample sizes are calculated based on each Distributor's total residential customer base and the proportion of overall TVA service area (Valley) residential customer base represented. TVA has developed a three tiered approach to ensure that each Distributor's survey sample size is sufficient for minimal analysis and based on customers served. More information on this approach can be found in **Section B.2**.

Samples sizes are calculated to ensure representation with a minimum sample size of 30 for each Distributor. Distributor samples are summed to the seven TVA geographically dispersed District levels. The total sample is designed to attain a margin of error less than 2 percent at the 95 percent confidence level for the overall TVA service area. With sufficient sample sizes, statistical analysis can be completed down to the individual Distributor service area. Results are summarized down to the Distributor level; however, in most cases, TVA recommends using District or TVA level results when making substantive decisions from the data. **Table 1** contains the overall framework using this sampling method.

**Table 1**  
**2007 TVA Residential Saturation Survey - Distributor Margins of Error**

<b>Tier</b>	<b>District</b>	<b>PD #</b>	<b>Distributor</b>	<b>FY 06 Residential Customers</b>	<b>Sample Adjusted to Actual Interviews</b>	<b>Sample Ratio to Households</b>	<b>Margin of Error 50%/50% split</b>
1	West TN	138	Memphis Light, Gas, and Water Division	365,327	293	0.080%	5.74%
1	Middle TN	158	Nashville Electric Service	330,517	266	0.080%	6.02%
1	Northeast	106	Knoxville Utilities Board	166,569	134	0.080%	8.50%
1	Middle TN	321	Middle Tennessee Electric Membership Corporation	143,544	117	0.082%	9.10%
1	Southeast	37	EPB (Chattanooga)	142,000	114	0.080%	9.22%
1	Alabama	99	Huntsville Utilities	130,309	106	0.081%	9.56%
2	Southeast	381	Volunteer Energy Cooperative	88,307	73	0.083%	11.55%
2	Southeast	336	North Georgia Electric Membership Corporation	82,742	67	0.081%	12.06%
2	Middle TN	288	Cumberland Electric Membership Corporation	71,617	58	0.081%	12.98%
2	Northeast	105	Johnson City Power Board	61,045	49	0.080%	14.15%
2	Middle TN	291	Duck River Electric Membership Corporation	57,081	48	0.084%	14.29%
2	Kentucky	383	Warren Rural Electric Cooperative Corporation	47,332	38	0.080%	16.11%
2	Middle TN	40	Clarksville Department of Electricity	45,095	36	0.080%	16.57%
2	Northeast	114	Lenoir City Utilities Board	44,249	37	0.084%	16.33%

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3	West TN	357	Southwest Tennessee Electric Membership Corporation	40,072	35	0.087%	16.81%
3	Kentucky	374	Tri-County Electric Membership Corporation	40,046	35	0.087%	16.81%
3	Middle TN	149	Murfreesboro Electric Department	39,819	34	0.085%	17.06%
3	Middle TN	380	Upper Cumberland Electric Membership Corporation	39,623	34	0.086%	17.06%
3	Alabama	72	Florence Utilities	38,705	31	0.080%	17.89%
3	Northeast	273	Appalachian Electric Cooperative	37,125	30	0.081%	18.20%
3	Kentucky	337	Pennyrite Rural Electric Corporation	35,663	30	0.084%	18.20%
3	Southeast	275	Blue Ridge Mountain Electric Membership Corporation	35,104	31	0.088%	17.89%
3	Mississippi	300	4-County Electric Power Association	34,872	30	0.086%	18.20%
3	Alabama	312	Joe Wheeler Electric Membership Corporation	33,745	30	0.089%	18.20%
3	Alabama	285	Cullman Electric Cooperative	33,643	32	0.095%	17.60%
3	Mississippi	372	Tombigbee Electric Power Association	32,436	33	0.102%	17.32%
3	Alabama	12	Athens Utilities (AL)	30,914	30	0.097%	18.20%
3	Kentucky	385	West Kentucky Rural Electric Corporation	30,504	34	0.111%	17.06%
3	Northeast	81	Greenville Light and Power System	30,084	30	0.100%	18.20%
3	Northeast	198	Sevier County Electric System	30,053	30	0.100%	18.20%
3	Middle TN	318	Meriwether Lewis Electric Corporation	28,577	30	0.105%	18.20%
3	Southeast	354	Sequachee Valley Electric Corporation	28,453	30	0.105%	18.20%
3	West TN	303	Gibson Electric	28,395	30	0.106%	18.20%

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			Membership Corporation				
3	Northeast	30	Bristol Tennessee Electric System	27,928	30	0.107%	18.20%
3	Mississippi	279	Central Electric Power Association	27,599	30	0.109%	18.20%
3	West TN	102	Jackson Energy Authority	27,549	31	0.113%	17.89%
3	Middle TN	62	Dickson Electric System	26,986	30	0.111%	18.20%
3	Northeast	325	Mountain Electric Cooperative	26,726	30	0.112%	18.20%
3	Southeast	297	Fort Loudoun Electric Cooperative	26,188	32	0.122%	17.60%
3	Middle TN	278	Caney Fork Electric Cooperative, Inc.	25,812	33	0.128%	17.32%
3	Northeast	46	Clinton Utilities Board	25,147	31	0.123%	17.89%
3	Alabama	351	Sand Mountain Electric Cooperative	24,772	32	0.129%	17.60%
3	Northeast	346	Powell Valley Electric Cooperative	24,709	31	0.125%	17.89%
3	Northeast	309	Holston Electric Cooperative	24,277	31	0.128%	17.89%
3	Southeast	43	Cleveland Utilities	24,144	32	0.133%	17.60%
3	Northeast	7	Alcoa Electric Department, City of	22,845	31	0.136%	17.89%
3	Alabama	61	Decatur Utilities	22,465	32	0.142%	17.60%
3	Northeast	65	Elizabethton Electric System	22,289	32	0.144%	17.60%
3	Kentucky	29	Bowling Green Municipal Utilities	22,084	30	0.136%	18.20%
3	Mississippi	360	Tallahatchie Valley Electric Power	21,511	31	0.144%	17.89%
3	Mississippi	331	Northcentral Mississippi Electric Power Association	20,505	31	0.151%	17.89%
3	Middle TN	49	Columbia Power & Water Systems	19,877	30	0.151%	18.20%
3	Kentucky	173	Paducah Power System	18,731	30	0.160%	18.20%

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3	West TN	120	Lexington Electric System	17,632	30	0.170%	18.20%
3	Northeast	108	LaFollette Utilities	17,186	30	0.175%	18.20%
3	Alabama	282	Cherokee Electric Cooperative	17,012	30	0.176%	18.20%
3	Northeast	132	Maryville Electric Department, City	16,701	30	0.180%	18.20%
3	Northeast	167	Newport Utilities	16,607	30	0.181%	18.20%
3	West TN	235	Weakley County Municipal Electric System	16,540	35	0.212%	16.81%
3	Middle TN	111	Lawrenceburg Utility Systems	16,488	30	0.182%	18.20%
3	West TN	339	Pickwick Electric Cooperative	16,212	31	0.191%	17.89%
3	Mississippi	333	North East Mississippi Electric Power Association	16,086	30	0.186%	18.20%
3	Middle TN	363	Tennessee Valley Electric Cooperative	15,421	31	0.201%	17.89%
3	Alabama	317	Marshall-DeKalb Electric Cooperative	15,336	30	0.196%	18.20%
3	Alabama	201	Sheffield Utilities	15,265	30	0.197%	18.20%
3	Middle TN	70	Fayetteville Public Utilities	15,046	30	0.199%	18.20%
3	West TN	174	Paris Board of Public Utilities	14,964	32	0.214%	17.60%
3	Mississippi	270	Alcorn County Electric Power Association	14,284	32	0.224%	17.60%
3	Southeast	377	Tri-State Electric Membership Corporation	14,256	36	0.253%	16.57%
3	Mississippi	345	Pontotoc Electric Power Association	14,231	32	0.225%	17.60%
3	Alabama	330	North Alabama Electric Cooperative	14,217	31	0.218%	17.89%
3	Northeast	342	Plateau Electric Cooperative	13,830	30	0.217%	18.20%
3	Northeast	169	Oak Ridge Electric Department	13,094	32	0.244%	17.60%
3	West TN	34	Carroll County Electrical	12,756	31	0.243%	17.89%

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			Department				
3	West TN	283	Chickasaw Electric Cooperative	12,521	31	0.248%	17.89%
3	Mississippi	327	Natchez Trace Electric Power Association	12,393	30	0.242%	18.20%
3	Alabama	274	Arab Electric Cooperative	11,977	30	0.250%	18.20%
3	Middle TN	182	Pulaski Electric System	11,595	30	0.259%	18.20%
3	Southeast	189	Rockwood Electric Utility	11,343	31	0.273%	17.89%
3	Middle TN	53	Cookeville Electric Department	11,195	30	0.268%	18.20%
3	Northeast	144	Morristown Utility Systems	11,118	33	0.297%	17.32%
3	Kentucky	95	Hopkinsville Electric System	10,973	30	0.273%	18.20%
3	Mississippi	369	Tishomingo County Electric Power Association	10,933	30	0.274%	18.20%
3	Middle TN	79	Gallatin Department of Electricity	10,855	31	0.286%	17.89%
3	Mississippi	226	Tupelo Water & Light Department, City of	10,818	32	0.296%	17.60%
3	Mississippi	348	Prentiss County Electric Power Association	10,811	32	0.296%	17.60%
3	Southeast	17	Athens Utilities Board (TN)	10,748	30	0.279%	18.20%
3	Mississippi	366	Tippah Electric Power Association	10,394	30	0.289%	18.20%
3	Alabama	23	Bessemer Electric Service	10,145	30	0.296%	18.20%
3	Mississippi	214	Starkville Electric Department	10,127	30	0.296%	18.20%
3	Mississippi	293	East Mississippi Electric Power Association	10,025	31	0.309%	17.89%
3	West TN	64	Dyersburg Electric System	9,726	30	0.308%	18.20%
3	Northeast	85	Harriman Utility Board	9,674	30	0.310%	18.20%
3	Mississippi	52	Columbus Light	9,471	30	0.317%	18.20%

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			and Water Department				
3	West TN	27	Bolivar Electric Department	9,005	30	0.333%	18.20%
3	Mississippi	93	Holly Springs Utility Department	8,861	30	0.339%	18.20%
3	Mississippi	324	Monroe County Electric Power Association	8,798	30	0.341%	18.20%
3	Southeast	123	Loudon Utilities	8,665	30	0.346%	18.20%
3	West TN	20	Benton County Electric System	8,583	32	0.373%	17.60%
3	West TN	295	Forked Deer Electric Cooperative, Inc.	8,554	30	0.351%	18.20%
3	Middle TN	224	Tullahoma Utilities Board	8,437	31	0.367%	17.89%
3	Mississippi	161	New Albany Light, Gas & Water, City of	8,034	31	0.386%	17.89%
3	Southeast	58	Dayton Electric Department, City of	7,840	30	0.383%	18.20%
3	Alabama	6	Albertville Municipal Utilities Board	7,797	30	0.385%	18.20%
3	Middle TN	206	Shelbyville Power System	7,741	30	0.388%	18.20%
3	Northeast	66	Erwin Utilities	7,684	31	0.403%	17.89%
3	Southeast	217	Sweetwater Utilities Board	6,720	30	0.446%	18.20%
3	Alabama	195	Scottsboro Electric Power Board	6,673	30	0.450%	18.20%
3	Alabama	301	Franklin Electric Cooperative	6,668	30	0.450%	18.20%
3	Middle TN	212	Springfield Electric	6,561	30	0.457%	18.20%
3	Alabama	56	Cullman Power Board	6,544	31	0.474%	17.89%
3	West TN	142	Milan Public Utilities	6,422	32	0.498%	17.60%
3	Kentucky	153	Murray Electric System	6,189	30	0.485%	18.20%
3	Alabama	76	Fort Payne Improvement Authority	6,138	30	0.489%	18.20%
3	Middle TN	135	McMinnville Electric System	6,052	31	0.512%	17.89%

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3	Mississippi	172	Oxford Electric Department, City of	5,793	30	0.518%	18.20%
3	Alabama	155	Muscle Shoals Electric Board	5,575	30	0.538%	18.20%
3	West TN	186	Ripley Power & Light Company	5,517	30	0.544%	18.20%
3	West TN	230	Union City Electric System	5,241	30	0.572%	18.20%
3	Kentucky	80	Glasgow Electric Plant Board	5,158	30	0.582%	18.20%
3	Alabama	82	Guntersville Electric Board	4,725	32	0.677%	17.60%
3	Kentucky	133	Mayfield Electric & Water Systems	4,716	30	0.636%	18.20%
3	Middle TN	241	Winchester Utilities	4,453	30	0.674%	18.20%
3	Southeast	67	Etowah Utilities Department	4,382	32	0.730%	17.60%
3	West TN	33	Brownsville Utility Department, City of	4,340	31	0.714%	17.89%
3	Alabama	88	Hartselle Utilities	4,193	30	0.715%	18.20%
3	Mississippi	170	Okolona Electric Department, City of	4,184	30	0.717%	18.20%
3	Middle TN	117	Lewisburg Electric System	4,140	30	0.725%	18.20%
3	Alabama	192	Russellville Electric Board (AL)	3,918	30	0.766%	18.20%
3	Kentucky	77	Franklin Electric Plant Board	3,787	30	0.792%	18.20%
3	West TN	96	Humboldt Utilities	3,658	30	0.820%	18.20%
3	Northeast	103	Jellico Electric and Water System	3,640	30	0.824%	18.20%
3	West TN	55	Covington Electric System	3,626	35	0.965%	16.81%
3	Alabama	229	Tuscumbia Electricity Department	3,570	30	0.840%	18.20%
3	Mississippi	238	West Point Electric System, City of	3,294	32	0.971%	17.60%
3	Kentucky	194	Russellville Electric Board (KY)	3,249	30	0.923%	18.20%
3	Kentucky	181	Princeton Electric Plant Board	3,247	32	0.986%	17.60%
3	Southeast	152	Murphy Electric Power Board, Town of	3,200	34	1.063%	17.06%

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3	Middle TN	146	Mount Pleasant Power System	3,146	30	0.954%	18.20%
3	Mississippi	9	Amory Utilities, City of	3,097	30	0.969%	18.20%
3	Mississippi	178	Philadelphia Utilities	3,015	33	1.095%	17.32%
3	Kentucky	306	Hickman-Fulton Counties Rural Electric Cooperative Corporation	2,977	30	1.008%	18.20%
3	Kentucky	143	Monticello Electric Plant Board	2,785	29	1.041%	18.52%
3	Mississippi	3	Aberdeen Electric Department, City of	2,750	30	1.091%	18.20%
3	Mississippi	126	Louisville Utilities	2,634	32	1.215%	17.60%
3	Alabama	220	Tarrant Electric Department	2,545	30	1.179%	18.20%
3	Middle TN	211	Sparta Electric Department	2,040	31	1.520%	17.89%
3	Middle TN	208	Smithville Electric System	1,994	33	1.655%	17.32%
3	West TN	223	Trenton Light & Water Department	1,934	30	1.551%	18.20%
3	Kentucky	19	Benton Electric System	1,788	31	1.734%	17.89%
3	Mississippi	232	Water Valley Electric Department, City of	1,563	30	1.919%	18.20%
3	Kentucky	78	Fulton Electric System	1,426	31	2.174%	17.89%
3	West TN	164	Newbern Electric Water & Gas	1,418	31	2.186%	17.89%
3	West TN	210	Somerville Utility Department, Town of	1,201	31	2.581%	17.89%
3	Mississippi	129	Macon Electric Department, City of	976	31	3.176%	17.89%
3	Kentucky	91	Hickman Electric System	951	31	3.260%	17.89%
3	Southeast	39	Chickamauga Electric System	844	35	4.147%	16.81%
3	Alabama	54	Courtland Electric Department	655	30	4.580%	18.20%
	<b>Valley Total</b>			<b>3,741,028</b>	<b>5,885</b>	<b>0.157%</b>	<b>1.30%</b>



Using U.S. Postal Service (USPS) zip codes as a defining frame, a contractor selected by RFP determines the ultimate sample using random digit dialing procedures. In some cases, the final sample size may be exceeded by one or two interviews for a specific Distributor. This occurs when a Distributor's quota has not been met but a call is in process and an additional call is dialed. Once the desired number of completed interviews for a specific Distributor are reached, no further calls are dialed within that Distributor's service area; however, all interviews that are in process are completed.

Various methods are used to calculate response rates. TVA computes several rates for this survey, preferring to use a cooperation rate as our response rate. In the last iteration of this survey, a 55.5 percent cooperation/response rate was attained. This rate is determined by summing the screen outs, quota-outs, and total completes and dividing by the sum of refusals, qualified refusals, qualified call backs, screen outs, quota-outs, and total completes as illustrated below.

$$\text{Completion/Response Rate} = \frac{\Sigma (\text{screen outs, quota-outs, total completes})}{\Sigma (\text{refusals, qualified refusals, qualified call backs, screen outs, quota-outs, total completes})}$$

2. The survey population is comprised of all residential households residing in the TVA service area. From this population, sample sizes are calculated based on each Distributor's total residential customer base and the proportion of overall TVA service area residential customers represented. Distributor samples decrease in size in three tiers. Each tier reflects a step change in overall residential customer base. The first tier is the top five or six largest distributors, followed by a second tier of distributors where a step change in size can be perceived. These first two tiers roughly represent 50 percent of the overall Valley customer base. The final tier includes the remaining distributors. Sample sizes are determined based on pooled proportion formula and are calculated to ensure representation of a minimum sample of 30 for each Distributor. Individual distributor samples are summed to the seven TVA geographically dispersed District levels. The total sample is designed to attain a margin of error less than 2 percent at the 95 percent confidence level for the overall Valley. See **Table 1** above.

When this method of sampling is used, Distributors within each stratum remain relatively stable due to similar growth patterns over time. While TVA would like to have this information annually with error margins of less than one percent, this is not practical from a cost standpoint or from a response burden. Attaining an overall margin of error of 1.3 percent to 1.8 percent provides sufficient differentiation that TVA can reasonably determine whether the *energy right* programs are having an indirect impact on Valley residents. While error margins at the Distributor and District level vary, trends and differences can be seen for the larger Distributors and the Districts. In addition, TVA offers Distributors the opportunity to request some data by Distributor groups. These may be groups of Distributors that wish to aggregate service areas for some reason. Reasons might include pooling advertising resources due to a viewing or listening area boundary and the need to determine appropriate messages for these boundaries. A frequency of two to three years provides data at sufficient intervals that trends and changes can be seen without overburdening residents with surveys. This is also possible since this is an indirect measure of the *energy right* programs' effectiveness.

Special sampling is required within the TVA service area since a listing of residences that are occupied for three months is not available. By requiring residence at the home where households are reached, TVA limits vacation and seasonal dwelling participation. Only households

occupying the residence at which they are reached for three or more months are included in the sample. Due to the quota sampling method described earlier, it is also necessary to weight responses by Distributor. This weighting is designed to account for the over representation of the samples for smaller Distributors or where one or two additional interviews occur. Weights are determined by dividing the proportion of the overall Valley residential customer base represented by a Distributor's residential customers by the proportion of the overall Valley residential sample represented by a Distributor's sample.

$$\text{Distributor Weight} = \frac{\text{Distributor Proportion of Residential Customers}}{\text{Distributor Proportion of Sample}}$$

For simplicity, weights are rounded to the nearest hundredth for analysis.

3. Response rates are maximized by using communications with TVA staff who reside in communities throughout the Valley, communications by Distributors with their staffs and customers, press releases, and by multiple call backs to unanswered phones. Up to 11 attempts are made to each selected telephone number before it is abandoned. In addition, contractors use interviewers with neutral accents to ensure understandability and make calls seven days per week. Calls are limited to before 9:00 PM and are not made during primary worship hours on Sunday. Call times are rotated for non-contacts to avoid selection bias against households where the head(s) are employed at more than one job or where shift work requires absence from the home during the evening. If a household is reached but unable to complete the interview, an appointment is made for a call back to complete the interview at a more convenient time. **Table 2** contains a summary of calls using this methodology in a prior survey.

Table 2 Dialing Summaries		
Number of Attempts Required to Obtain a Completed Interview		
1	2,738	46.5%
2	1,236	21.0%
3	625	10.6%
4	431	7.3%
5	291	4.9%
6	177	3.0%
7	134	2.3%
8	108	1.8%
9	73	1.2%
10	66	1.1%
11	6	0.1%

4. The survey instrument used may be modified slightly between iterations depending upon changes in language usage, appliance availability, and appliance usage patterns. However, the questions remain consistent overtime to enhance reliability. Modifications to the survey are carefully considered by various TVA staff that will use the information and are tested by the contractor when training their staff. Approximately five test interviews are conducted using the

final instrument. These interviews provide a final opportunity to identify any poorly or ambiguously worded questions. Test interviews also help to ensure that no regional patterns of language exist, potentially creating differing interpretations. These interviews as well as the training are monitored by TVA staff members. In addition, as interviews begin, calls are monitored closely in a further effort to insure reliability of the data gathered.

5. When questions regarding statistical aspects of the survey methodology and analysis arise, TVA relies on our contractor staff. For the most recent study, Abt SRBI was the contractor. Abt SRBI is a full-service global strategy and research organization specializing in public policy and opinion surveys, banking and finance, telecommunications, media, energy, transportation, insurance and health care. One of the Principals in the firm, John M. Boyle, serves as TVA's consultant in survey statistical matters. See the brief bio of Mr. Boyle below.

**John M. Boyle, Executive Vice President and  
Director Government Division**

John M. Boyle, Ph.D., is an Executive Vice President and Director of Abt SRBI's Washington area office. He is a specialist in public policy surveys and has directed many major studies for federal agencies. His study areas include epidemiology, health care utilization and outcomes, violence and post-traumatic stress disorder, service quality assessment, transportation, tax and veterans issues, program evaluation, and policy analysis. His studies are particularly notable for the high response rates achieved on exceedingly difficult subjects. For example, Dr. Boyle achieved a 95% response rate on the Air Force Agent Orange Health Survey and an 85% response rate on the Veterans' Administration Post-Traumatic Stress Disorder Study.

Dr. Boyle's Ph.D. was awarded by Columbia University, where he subsequently served on the research faculty at the School of Public Health and conducted research on drug abuse among adolescents and young adults. Dr. Boyle has taught at the University of Maryland and several universities in New York City. He has numerous professional publications. He has also served as a member on an FDA advisory committee.

Abt SRBI Government Services Division  
John M. Boyle, Ph.D., EVP  
8403 Colesville Road, Suite 820  
Silver Spring, MD 20910  
Phone: (301) 608-3883  
Fax: (301) 608-3888

Data will be collected by the Fort Meyers office of Abt SRBI under the oversight and direction of Carla P. Jackson, Vice President, Utilities and Energy Research. Ms. Jackson has worked on this research effort a number of times in the past. She is thoroughly familiar with TVA's business, research needs, and quality and accuracy requirements. See the brief bio of Ms. Jackson below.

**Carla P. Jackson, Vice President, Utilities  
and Energy Research**

Carla P. Jackson joined Abt SRBI as Director of its National Electric Utilities Division in Chattanooga, TN, after having worked at the Tennessee Valley Authority for almost 17 years. At TVA, one of the largest generators and providers of electric power in the world, Ms. Jackson's work included market research and program evaluation. She has a B.A. in industrial and labor relations from Cornell University and an M.A. in sociology from Brown. She has authored or co-authored numerous papers and presentations for electric utility organizations.

Carla P. Jackson, Vice President for Energy Research  
Abt SRBI  
7431 College Parkway, Suite A  
Fort Myers, FL 33907  
Phone: (239) 278-4044  
Fax: (239) 278-3601