Energy Efficiency as an Alternative Strategy for the Power4Georgians EMCs

Assessing the Economic Impact for Georgia Residents and Businesses

the Ochs Center for metropolitan studies

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Preface

This report was written by Dr. William Tharp and Lori Quillen at the Ochs Center for Metropolitan Studies, and was funded by the Rockefeller Family Fund. The report draws heavily on data compiled for two previous reports – one on residential energy efficiency by Southface Energy Institute and one on energy efficiency programs in Kentucky, written by Susan Zinga and Andy McDonald. The authors wish to thank David Wasserman of Southface, who served as a peer reviewer for this report.

Introduction

In January 2008, a new entity – Power4Georgians, LLC – announced plans to build an 850 MW coal-fired power plant in Washington County, Georgia. Originally, Power4Georgians consisted of a consortium of ten electric membership corporations (EMCs). In 2009, however, four of the original participants in the consortium announced that they were withdrawing from participation in the construction phase, leaving six EMCs – Central Georgia, Cobb, Pataula, Snapping Shoals, Upson and Washington - as the remaining members of Power4Georgians. Together, these six EMCs serve 43 counties and account for approximately six percent of the overall use of electricity in Georgia.

TABLE 1. COUNTIES COMPLETELY OR PARTIALLY SERVED BY THE SIX POWER4GEORGIANS EMCS

EMC	Counties Served by EMC
Central	Bibb, Butts, Clayton, Fayette, Henry, Jasper, Jones, Lamar, Monroe, Morgan, Newton, Pike, Putnam, Spalding
Cobb	Bartow, Cobb, Cherokee, Fulton, Paulding
Pataula	Randolph, Calhoun, Quitman, Clay
SSEMC	Newton, Rockdale, Henry, DeKalb, Butts, Walton, Jasper, Morgan
Upson	Upson, Pike, Talbot, Meriwether, Crawford, Taylor
Washington	Baldwin, Emanuel, Glascock, Hancock, Jefferson, Johnson, Laurens, Warren, Washington, Wilkinson

TABLE 2. PERCENT OF STATE ELECTRICITY USE IN THE SIX POWER4GEORGIANS EMCS

	Residential Electricity Sales (MWh)[1]	% of State Residential Electricity Use	Commercial and Industrial Sales (MWh)	% of State Commercial and Industrial Electricity Use	Total Electricity Sales (MWh)	% of Total State Electricity Use
State of Georgia	56,223,000	100.00%	81,051,000	100.00%	137,274,000	100.00%
Central Georgia EMC	708,156	1.26%	356,156	0.44%	1,064,312	0.78%
Cobb EMC	2,632,962	4.68%	1,254,909	1.55%	3,887,871	2.83%
Pataula EMC	49,382	0.09%	39,127	0.05%	88,509	0.06%
Snapping Shoals EMC	1,666,202	2.96%	453,733	0.56%	2,119,935	1.54%
Upson EMC	113,513	0.20%	15,590	0.02%	129,103	0.09%
Washington EMC	193,572	0.34%	192,189	0.24%	385,761	0.28%
Total	**5,363,787**	**9.54%**	**2,311,704**	**2.85%**	**7,675,491**	**5.59%**

[1] Data for the State of Georgia electricity sales are from the Federal Energy Information Administration's State Electric Profiles for 2007, which were accessed at: http://www.eia.doe.gov/cneaf/electricity/st_profiles/georgia.html. Data on electricity sales for Central, Cobb, Pataula, Upson, and Washington EMCs are from forms filed with the Rural Utility Service for 2008 obtained on September 3, 2009 pursuant to a Freedom of Information Act request. Data for Snapping Shoals EMC was obtained through a phone interview with Snapping Shoals EMC on October 7, 2009.

Opponents of Plant Washington have noted that it poses significant health and environmental threats.[2] Moreover, in a 2008 report, Synapse Energy Economics estimated that the cost of electricity for Plant Washington would be nearly eight cents per kilowatt hour, and that it could rise as high as 13.7 cents per kilowatt hour due to impending climate change legislation.[3] In addition, an earlier assessment by the Ochs Center found that plant construction could pose fiscal risk for Washington County and that the plant was unlikely to result in significant permanent jobs for Washington County residents.[4]

Given the health, environmental, cost and fiscal concerns related to construction of Plant Washington, it makes sense to assess alternatives.

This paper examines the potential for meeting future energy needs of the Power4Georgians EMCs through energy efficiency measures. It finds that energy efficiency initiatives could eventually provide over 1.5 million megawatt hours of savings annually at a cost significantly less than electricity that would be generated by Plant Washington. Implementation of these energy efficiency initiatives would have an immediate, significant economic impact – creating the equivalent of $3.1 billion in economic activity and 17,000 years of employment. The economic impact of low cost, feasible energy efficiency initiatives in the Power4Georgians service area would be spread across all 43 counties served in whole or in part by six EMCs.

[2] According to the Southern Environmental Law Center, the plant would "emit thousands of tons of soot- and smog-forming pollutants every year in a county already experiencing high levels of air pollution. Mercury from the plant would contaminate the Ogeechee River, which is already so polluted with mercury that the state health department limits the amount of fish that should be eaten from the river. The plant would consume up to 16 million gallons of water a day, at a time when the entire state of Georgia is struggling to make do with limited water resources." Accessed at www.southernenvironment.org.

[3] Schlissel, David. "The Risks of Building and Operating Plant Washington." Synapse Energy Economics, December, 2008. Accessed at: http://www.synapse-energy.com/Downloads/SynapseReport.2008-12.0.Building-Plant-Washington.08-043.pdf.

[4] Memorandum from David Eichenthal, Ochs Center to Washington County Board of Commissioners, December 7, 2009.

The Case for an Energy Efficiency Alternative

Energy demand in the Power4Georgians region could be reduced greatly by implementing utility-led energy efficiency programs targeting residential, commercial and industrial buildings.

Residential Energy Efficiency in Georgia

In February 2009, Southface Energy Institute released a report on the potential cost and energy savings from applying energy efficiency measures to single-family residences in the State of Georgia. The report, "Energy Efficiency: Georgia's Highest Priority,"[5] outlined a series of specific energy efficiency measures and calculated the cost and potential savings from installing these measures based on the age of the home. It is important to take into account the age of homes when considering energy efficiency potential because older homes may require a higher investment, but could also achieve greater energy savings than homes built more recently.

TABLE 3. Potential Energy Savings from Residential Energy Efficiency Measures for Gas-Heated and All Electric Homes and Projected Cost, as Calculated by Southface

	Potential Savings: Gas Heated (kWh)[6]	Potential Savings: All Electric (kWh)	Average Cost of Installing Energy Efficiency Measures
2005-Present	2,417	3,205	$2,010
1980-2004	2,614	4,098	$2,760
1979 and before	3,030	8,813	$5,410

Using county-level data from the Bureau of the Census[7] on the number of households and the year housing structures were built, the Ochs Center was able to estimate the number of houses by age for each of the EMCs in the Power4Georgians service area.[8]

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[5] Southface Energy Institute, April 2009. Accessed at: http://www.southface.org/web/resources&services/toolkits-casestudies/policy-docs-art/Energy-efficiency-whitepaper.pdf

[6] While beyond the scope of this paper, Southface estimates that these energy efficiency measures would also provide significant savings in therms for natural gas and propane heated homes.

[7] Data is from the 2000 Census and the 2008 American Community Survey.

[8] For example, the Upson County EMC includes customers in six counties with 34,000 households. However, Upson EMC only serves 8,444 residential customers, the equivalent of just over 24% of households in the six county area. According to 2000 Census and 2008 American Community Survey data for the six county area, 57% of housing units were built before or in 1979, 42% were built between 1980 and 2005 and 1% were built after 2005. These proportions were applied to the 8,444 residential customers served by Upson EMC. The same method was used for all of the EMCs to estimate the number of occupied housing units by each age.

TABLE 4. ESTIMATED NUMBER OF HOUSING UNITS BY AGE SERVED BY THE SIX POWER4GEORGIANS EMCS

		Number of Housing Units By Age		
	Total Residential Customers	2005-Present	1980-2004	1979 and before
Central EMC	45,020	1,702	25,848	17,470
Cobb EMC	172,850	9,429	98,790	64,331
Pataula EMC	4,675	144	1,830	2,701
Snapping Shoals EMC	86,999	6,230	44,401	36,368
Upson EMC	8,444	40	3,583	4,821
Washington EMC	14,685	86	6,760	7,839
Total	**332,673**	**17,631**	**181,212**	**133,530**

Applying the projected energy savings in the Southface report to all homes in the Power4Georgians service area and accounting for differences in the age of the residential unit, projected annual energy savings could reach as high as 1,342,905 MWh and could reduce peak electric loads by as much as 355 MW, as shown in Table 4 below.[9]

[9] Peak electric loads occur at times when there is a very high demand for electricity (commonly on hot summer days in Georgia). In addition to providing direct energy savings, energy efficiency measures can also help to reduce the peak electrical load, during these high demand times. In their report, Southface calculated the potential peak load reduction of energy efficiency measures for the State of Georgia using a peak load reduction algorithm through the residential energy analysis software, Rem Rate. In order to calculate the potential load reduction for our focus area, we utilized the same ratio of MWh to MW that was used in the Southface report. For more information on their methodology, the Southface report can be accessed here: http://www.southface.org/web/resources&services/toolkits-casestudies/policy-docs-art/Energy-efficiency-whitepaper.pdf. For more information on the potential peak load reduction from energy efficiency see: "Examining the Peak Demand Impacts of Energy Efficiency: A review of Program Experience and Industry Practices," Report Number U072, Dan York, Martin Kushler, and Patti White, American Council for an Energy-Efficient Economy, 2007. Accessed at: http://www.aceee.org/pubs/u071.htm

TABLE 5. POTENTIAL PEAK ANNUAL SAVINGS (MWH) FROM ENERGY EFFICIENCY MEASURES FOR GAS-HEATED[10] AND ALL ELECTRIC HOMES BY EMC[11]

Age of Home:	2005-Present		1980 - 2004		1979 and Before		
	Savings: Gas Heated	Savings: All Electric	Savings: Gas Heated	Savings: All Electric	Savings: Gas Heated	Savings: All Electric	Total Peak Annual Savings
Central EMC	2,468	2,182	40,540	42,370	31,760	61,585	180,906
Cobb EMC	13,674	12,088	154,942	161,937	116,954	226,780	686,374
Pataula EMC	209	185	2,870	3,000	4,910	9,522	20,695
Snapping Shoals EMC	9,035	7,987	69,639	72,782	66,117	128,204	353,764
Upson EMC	58	51	5,620	5,873	8,765	16,995	37,362
Washington EMC	125	110	10,602	11,081	14,251	27,634	63,804
TOTAL	**25,568**	**22,603**	**284,213**	**297,043**	**242,758**	**470,720**	**1,342,905**

In weighing the feasibility of an energy efficiency alternative, it is important to consider the potential cost of implementation. The Southface Report provides detailed estimates – again disaggregated by the age of the housing unit – for a series of specific energy efficiency measures:

- Duct and envelope sealing – Duct sealing is the process of sealing all connections in the HVAC unit and duct work in the home. Envelope sealing, also known as "weatherization," seals the inside perimeter of the home, including doors and windows, in order to prevent air leakage.

- Attic insulation – Many homes have little or inadequate attic insulation. Insulation in the attic increases efficiency heating and cooling the home.

- Wall insulation – Properly insulating exterior walls in the home increases the efficiency of home heating and cooling.

- Attic radiant barriers – Radiant barriers are reflective sheets that help to minimize radiant heat transfer from a roof to an attic. Attic radiant barriers help to keep an attic cool in the summer and can reduce a home's cooling load especially if an air handler and duct work are located in the attic.

- Water heater jackets – For older water heaters, heater jackets insulate and minimize heat loss from the water heater.

[10] Refers to use of natural gas, bottled, tank or LP gas to heat the home.
[11] According to 2006-2008 results of the American Community Survey, 52% of homes in Georgia are gas-heated and 46% are all electric. Accessed through the Census website at: http://factfinder.census.gov/servlet/DTTable?_bm=y&-geo_id=04000US13&-context=dt&-ds_name=ACS_2008_3YR_G00_&-tree_id=3308&-redoLog=false&-search_results=01000US&-mt_name=ACS_2008_3YR_G2000_B25117&-format=

- Air conditioning and heat pump tune ups – Annual tune ups of heating and cooling systems can improve efficiency.

- Use of Energy Star appliances – Energy Star is a federal government program that certifies appliances that meet strict energy efficiency guidelines.

- Use of compact fluorescent lighting – Compact fluorescent light bulbs (CFLs) use about 75% less energy and last about 10 times longer than traditional incandescent light bulbs.[12]

TABLE 6. COST OF ENERGY EFFICIENCY MEASURES BY AGE OF HOUSING UNIT AND TOTAL COST FOR ALL SIX EMCS

	2005-Present	All Houses in Six EMCs	1980-2004	All Houses in Six EMCs	Before 1979	All Houses in Six EMCs
EE Measures						
Duct Envelope Sealing	$750	$13,223,250	$750	$135,909,000	$750	$100,147,500
R-30 Attic Insulation	$0	$0	$750	$135,909,000	$900	$120,177,000
R-13 Wall Insulation	$0	$0	$0	$0	$2,500	$333,825,000
Radiant Barrier in Attic	$450	$7,933,950	$450	$81,545,400	$450	$60,088,500
50% Lights CFL	$60	$1,057,860	$60	$10,872,720	$60	$8,011,800
R-5 Water Heater Jacket	$30	$528,930	$30	$5,436,360	$30	$4,005,900
Energy Star Rebate	$500	$8,815,500	$500	$90,606,000	$500	$66,765,000
A/C Heat Pump Tune Up	$500	$8,815,500	$500	$90,606,000	$500	$66,765,000
Total Cost by Age	$2,290	**$40,374,990**	$3,040	**$550,884,480**	$5,690	**$759,785,700**
					Total Cost for All Units[13]	**$1,351,045,170**

As shown in Table 5, the total cost of applying these energy efficiency measures in the Power4Georgians service area would be approximately $1.35 billion. The residential energy efficiency initiatives would be implemented over a 14 year period – with full implementation and maximum annual energy savings achieved in the fourteenth year. For the purpose of this study, it is assumed that the initiatives, once implemented, would produce savings for fifteen years. Over the full implementation and savings period these residential initiatives would save a total 20.1 million MWh at a cost of less than seven cents per

[12] www.energystar.gov
[13] Unless otherwise indicated, the cost of implementation of energy efficiency initiatives does not include the cost of financing.

kWh – or roughly half the projected cost per kWh of Plant Washington once the effect of climate change legislation is accounted for.

TABLE 7. TOTAL ESTIMATED COST AND SAVINGS FROM ENERGY EFFICIENCY MEASURES FOR ALL HOMES IN THE POWER4GEORGIANS REGION OVER 28 YEARS

Total MWh Saved	20,143,614
Potential Peak Load Reduction (MW)	355
Total Cost	$1,351,045,170
Cost/kWh	$0.067

Commercial and Industrial Energy Efficiency in Georgia

Demand could also be reduced in the service area of the Power4Georgians' EMCs through implementation of energy efficiency measures targeted at commercial and industrial users. A May 2005 report by ICF Consulting, "Assessment of Energy Efficiency Potential in Georgia,"[14] projects that an aggressive, but realistic energy efficiency program could lead to an average savings of about 8% of current commercial and industrial electricity sales statewide.

The six EMCs participating in Power4Georgians had a total of 2.3 million kWh in commercial, small industrial and large industrial sales in 2008. Applying the statewide level of projected savings to these EMCs, commercial and industrial efficiency initiatives would eventually save approximately 185,000 MWh annually, and has the potential to reduce peak load by 193 MW.

[14] Jensen, Val and Eric Lounsbury. "Assessment of Energy Efficiency Potential in Georgia." Prepared for Georgia Environmental Facilities Authority by ICF Consulting, May, 2005.

TABLE 8. COMMERCIAL AND INDUSTRIAL ELECTRICITY SALES FOR SIX POWER4GEORGIANS EMCS[15]

	Commercial and Small Industrial Customers (small)	Commercial and Small Industrial Sales (kWh)	Large Industrial Customers	Large Industrial Sales (kWh)
Central Georgia EMC	4,418	142,053,459	70	214,102,671
Cobb EMC	14,364	989,356,678	47	265,552,702
Pataula EMC	202	4,950,831	1	34,176,521
Snapping Shoals EMC	4,517	266,582,958	48	187,150,139
Upson County EMC	791	11,856,011	3	3,733,896
Washington EMC	577	51,037,576	7	141,151,830
Subtotal	24,869	1,465,837,513	176	845,867,759
			Total Commercial and Industrial Sales (MWh)	**2,311,705**
			Percent Achievable Savings from Energy Efficiency	**8%**
			Total Potential Energy Savings in Power4Georgians Region Annually (MWh)	**184,936**

Again, the Ochs Center sought to weigh not just the potential for efficiency savings but the cost of achieving those savings. While the Southface Report was limited to an analysis of residential efficiency initiatives, a similar analysis was conducted in Kentucky that examined the costs of commercial and industrial efficiency initiatives.[16] These energy efficiency initiatives included:

- Energy efficient lighting – The installation of energy efficient lighting technology for commercial buildings, including sensors and compact fluorescent lighting can help to decrease electricity use.
- Demand response – Incentives for commercial and industrial customers can reduce electricity use during peak times, thereby reducing the peak demand for energy. Several new technologies are helping to automate this process by detecting the need for demand reduction, communicating the need to customers and verifying the response.
- Air conditioning tune ups – Annual air conditioner tune-ups can help to increase the efficiency of cooling commercial and industrial buildings.

[15] See Footnote 1.

[16] Zinga, Susan, and Andrew McDonald. "A Portfolio of Energy Efficiency and Renewable Energy Options for East Kentucky Power Cooperative", February 2008.

- Variable speed drives - Used in a wide variety of applications, including pumps, conveyors, fans and machine tool drives, variable speed drives control a given motor in order to match the system demand.

- Energy efficient motors – Replacement of older motors with new energy efficient motors for a variety of uses can help to reduce electricity use for commercial and industrial customers.

The efficiency initiatives detailed in the Kentucky study, when applied to commercial and industrial customers in the Power4Georgians region, would yield a savings of approximately 185,000 MWh, at a total implementation cost of $58 million.

TABLE 9. ENERGY EFFICIENCY MEASURES FOR COMMERCIAL AND INDUSTRIAL CUSTOMERS: COST

Commercial and Industrial Implementation	Participants	Investment/Participant	Total Investment
Air Conditioner Tune Up	13,678	$ 366	$ 5,006,148
Demand Response	3,980	$ 2,645	$ 10,527,100
Energy Efficient Lighting	21,140	$ 1,875	$ 39,637,500
Variable Speed Drives	88	$ 26,714	$ 2,350,832
Energy Efficient Motors	88	$ 5,258	$ 462,704
TOTAL INVESTMENT			**$ 57,984,284**

Assuming implementation over 14 years and recurring savings for 15 years, the industrial and commercial savings initiatives would produce nearly 2.8 million MWh of savings at a cost of 2.1 cents per kWh.

TABLE 10. Energy Efficiency Measures for Commercial and Industrial Customers: Potential Savings

	Participants	Years of Savings	Annual Savings	Maximum Peak Load Reduction[17]	Total Savings (MWh)
Air Conditioner Tune Up	13,678	15	2,400	29	492,408
Demand Response	3,980	15	10,500	139	626,850
Energy Efficient Lighting	21,140	15	4,800	21	1,522,080
Variable Speed Drives	88	15	98,000	2	129,360
Energy Efficient Motors	88	15	12,000	2	15,840
TOTAL				**193**	**2,786,538**
Cost/KWh					**$ 0.0208**

Implementation

Eventually, residential, commercial and industrial energy efficiency measures could provide as much as 1.5 million MWh in energy savings annually, approximately 20% of the region's current electricity sales. This reflects an implementation process that achieves savings of 1.5% per year over 14 years. Assuming that these measures produce savings for a 15 year lifetime, the total lifetime of the initiative would be 28 years. For example, energy efficiency measures implemented in the final year – year 14 – of the program, would produce energy savings through year 28.

[17] Zinga and McDonald obtained the estimates of peak load reduction by energy efficiency measure from the Eastern Kentucky Power Cooperative's Integrated Resource Plan, published in October 2006. This report calculated the potential energy savings and peak load reduction of a number of energy efficiency measures using DSManager modeling software.

TABLE 11. 14-Year Implementation of Residential, Commercial and Industrial Energy Efficiency Measures and Potential Energy Savings

YEAR	Savings (MWh)	Peak Demand Reduction (MW)
1	76,700	27
2	153,400	55
3	268,450	96
4	383,500	137
5	498,550	178
6	613,600	219
7	728,650	260
8	843,700	301
9	958,750	342
10	1,073,800	384
11	1,188,850	425
12	1,303,900	466
13	1,418,950	507
14	1,534,000	548
15	1,534,000	548
16	1,457,300	520
17	1,380,600	493
18	1,265,550	452
19	1,150,500	411
20	1035,450	370
21	920,400	329
22	805,350	288
23	690,300	247
24	575,250	205
25	460,200	164
26	345,150	123
27	230,100	82
28	115,050	41
	23,010,000	

Over the full implementation and savings period, residential, commercial and industrial energy efficiency initiatives could provide a total of just over 23 million MWh in energy savings, and as much as 548 MW in peak load reduction, at a cost of six cents per kWh – substantially less than the projected cost of Plant Washington.

TABLE 12. SUMMARY OF COSTS AND GENERATION POTENTIAL FOR ENERGY EFFICIENCY MEASURES

	Total MWh	Capacity (MW)	Cost/kWh	Total Cost
Residential Energy Efficiency	20,143,614	355	0.067	$1,351,045,170
Commercial and Industrial Energy Efficiency	2,786,538	193	0.021	$57,984,284
Total	**22,930,152**	**548**	**0.06**	**$1,409,029,454**

Economic Impact of Energy Efficiency

Implementation of the energy efficiency initiatives outlined above would directly result in 9,975 years of employment over the 14-year implementation period, or an average of 712 jobs per year. Overall, investment in the energy efficiency programs outlined in this report would result in more than $3 billion in economic activity and approximately 17,000 job-years of employment throughout the entire 43-county area serviced by the six Power4Georgians EMCs.

By comparison, the developers of Plant Washington have stated that, at its peak, construction on the project would yield 1,600 jobs and a projected total of 3,750 total years of employment: upon completion, plant operation would result in just 128 permanent jobs. [18] Construction and plant operation jobs would primarily benefit residents of the counties immediately surrounding the Washington County site of the plant. On the other hand, plant construction and operation would have little economic benefit for the residents of EMCs who live outside of the Washington County labor shed – despite the fact that those EMCs are contributing to the cost of the development of the plant.

[18] Job projections are based on information at the Power4Georgians website at http://power4georgians.com/wcpp.aspx and a study for the Washington County Chamber of Commerce, Robert Lann, *Fiscal Impact Analysis of the Proposed Coal-Fired Power Plant in Washington County,* Georgia Tech Enterprise Innovation Institute, 2007.The Chamber of Commerce study did not calculate indirect or induced economic impact of the plant.

TABLE 13. COMPARISON OF DIRECT EMPLOYMENT (IN YEARS) OVER A 14-YEAR PERIOD

	Implementation/Construction Years of Employment	Operations Years of Employment	Total
Energy Efficiency Initiatives	9,975 (over 14 years)	N/A	9,975
Plant Washington	3,750 (over 5 years)	1,152 (over 9 years)	4,902

Translating Investment in Energy Efficiency into Economic Impact

To assess the economic impact of the energy efficiency strategy, the total projected investment of $1.4 billion in residential and commercial/industrial energy efficiency initiatives was allocated based on the number of existing residential and commercial customers in each EMC in 2008. In total, the six partner EMCs had 332,673 residential customers and 25,045 commercial/industrial customers.

TABLE 14. RESIDENTIAL AND COMMERCIAL/INDUSTRIAL ALLOCATION BY EMC, 2008

	Residential Allocation		Commercial/Industrial Allocation	
EMC	**Customers**	**%**	**Customers**	**%**
Central Georgia EMC	45,020	13.53	4,488	17.92
Cobb EMC	172,850	51.96	14,411	57.54
Pataula EMC	4,675	1.41	203	0.81
Snapping Shoals EMC	86,999	26.15	4,565	18.23
Upson County EMC	8,444	2.54	794	3.17
Washington EMC	14,685	4.41	584	2.33
Total	**332,673**	**100.00**	**25,045**	**100.00**

The impact model was constructed to account for industry-specific investments related to each residential, commercial and industrial energy efficiency initiative. In this way, direct investments for each initiative were assumed to be increases in output for each relevant industry. Indirect and induced impacts were then estimated based on established industry linkages for each initiative. Efficiency initiatives were assigned to each sector as follows:

- **NAICS23822[19] -- Construction: Heating/Plumbing/AC Contractors**
    - Residential duct envelope sealing
    - Residential AC/heat pump tune-up
- **NAICS 23831 -- Construction: Drywall/Insulation contractors**
    - Residential R-30 attic insulation
    - Residential R-13 wall insulation
    - Residential radiant barrier in attic
    - Residential R-5 water heater jacket
- **NAICS 444 – Electronics/Appliance Stores**
    - Residential 50% lights CFL
    - Residential energy star rebate
    - Commercial/industrial energy efficient lighting
- **NAICS 8112 – Electronic/Precision Equipment Repair/Maintenance**
    - Commercial/industrial demand response
- **NAICS 8113 – Commercial/Industrial Machinery/Equipment Repair/Maintenance**
    - Commercial/industrial variable speed drives
    - Commercial/industrial energy efficient motors

Using these disaggregated, industry-specific investment levels, the Ochs Center calculated economic activity using IMPLAN, an impact modeling software program created by the Minnesota IMPLAN Group, Inc. The IMPLAN model adapts national input-output matrices to the county level so that impact estimates can be generated at the county level of analysis. This model allows for the assessment of employment, output[20] and income[21] impacts at three different levels:

- **Direct Impacts:** Impacts directly attributable to the initial investment that occurs within the reference economy.
- **Indirect Impacts:** Impacts attributable to industry-to-industry transactions only, reflecting the linkages between suppliers.

[19] U.S. Census Bureau, North American Industrial Classification System, www.census.gov/eos/www/naics.
[20] Output is the total value of production by an industry over a given time period.
[21] Income includes proprietary (small business) income and employee salaries and benefits for a given industry over a given time period.

- **Induced Impacts:** Impacts attributable to expenditures in the local economy by employees and owners of directly and indirectly affected firms.[22]

Projections of Economic Impact by EMC

During the implementation period, the proposed strategy of residential, commercial and industrial efficiency initiatives will directly create 9,975 job-years and over $1.4 billion in economic activity within the areas served by the six EMCs.

Most firms engaged in the implementation of the initiatives are projected to be locally-based, increasing retention of economic impacts within EMC boundaries.

TABLE 15. DIRECT ECONOMIC IMPACTS BY EMC FROM ENERGY EFFICIENCY INVESTMENTS

EMC	Employment	Income	Output
Central Georgia EMC	1,491.7	$74,512,241	$193,754,512
Cobb EMC	5,023.8	$306,468,480	$734,592,307
Pataula EMC	117.3	$5,612,459	$19,450,133
Snapping Shoals EMC	2,621.9	$136,160,074	$364,106,758
Upson County EMC	247.9	$12,004,579	$36,095,366
Washington EMC	472.4	$20,052,618	$61,030,391
Total	**9,975.0**	**$554,810,451**	**$1,409,029,467**

As direct local investment in efficiency creates increased economic activity in directly affected industries, other linked industries in the regional (defined by EMC boundaries) economy increase production to meet demand. In the aggregate, the indirect employment effect is projected to be 3,411 job-years. Output and income are expected to increase by $424 million and $155 million, respectively as a result of investment in efficiency over the entire six-EMC area.

[22] For example, impacts from investment in the Construction: Heating/Plumbing/AC Contractors sector are derived from the direct increases in output as a result of such investment - and the jobs and income required to support that increase in production in that sector. Impacts also result from indirect impacts to output, jobs and income in additional sectors resulting from the industry by industry transactions that occur as the Construction: Residential Electrical sector makes purchases from suppliers (and those suppliers make purchases from their suppliers). Induced impacts also occur as workers' households purchase goods and services from industries that serve a residential clientele. Indirect and induced impacts are subject to importing/exporting behavior of firms that produce "leakage" out of the economy of reference. The magnitude of "leakage" will reduce impacts in the reference economy.

TABLE 16. INDIRECT ECONOMIC IMPACTS BY EMC FROM ENERGY EFFICIENCY INVESTMENTS

EMC	Employment	Income	Output
Central Georgia EMC	531.2	$20,690,069	$61,157,787
Cobb EMC	1,708.8	$86,924,972	$228,060,359
Pataula EMC	27.7	$713,779	$2,139,839
Snapping Shoals EMC	936.0	$40,368,687	$112,392,787
Upson County EMC	69.1	$2,116,871	$6,819,614
Washington EMC	138.6	$4,418,965	$13,643,943
Total	**3,411.4**	**$155,233,343**	**$424,214,329**

Increased investment -- and the resulting increased economic activity – also affects households through the income effect. Induced impact estimates capture household consumption behavior that results from increased incomes of employees within directly and indirectly affected industries. The induced employment effect resulting from implementation of the efficiency portfolio is 3,998 job-years. Increased household consumption behavior is also projected to result in an additional $475 million in output and $154 million in income.

TABLE 17. INDUCED ECONOMIC IMPACTS BY EMC

EMC	Employment	Income	Output
Central Georgia EMC	645.4	$21,665,041	$69,180,456
Cobb EMC	1,943.3	$82,759,423	$249,246,803
Pataula EMC	26.4	$560,220	$2,337,028
Snapping Shoals EMC	1,197.9	$43,954,117	$137,992,214
Upson County EMC	61.5	$1,514,999	$5,478,957
Washington EMC	123.7	$3,168,582	$10,631,020
Total	**3,998.2**	**$153,622,382**	**$474,866,478**

In total – considering direct, indirect, and induced impacts - investment in the residential and commercial/industrial efficiency portfolio is projected to create 17,384 job-years, nearly $2.3 billion in output, and over $863 million in income across the counties served by the six EMCs in Power4Georgians.[23]

[23] Another alternative strategy to meeting demand needs would be renewable energy. A renewable energy approach would also result in both construction and permanent jobs. Because there are no specific projections for the location or cost of new renewable energy facilities, it is not possible to provide detailed projections of economic impact. Research suggests that renewable energy source development could yield significant economic benefits. For example, a proposed 100 MW biomass plant in Florida is projected to create 350 construction jobs, 45 direct permanent jobs and several hundred jobs related to providing forestry materials (Megan Rolland, "Biomass plant approved," *Gainesville Sun*, May 8, 2009). Similarly, Oglethorpe Power Corporation's three planned 100 MW biomass power facilities in Georgia have the potential to each create 40 direct permanent jobs related to plant operations (see http://www.thebioenergysite.com/news/1789/oglethorpe-plans-biomass-electric-generating-plants). When direct, indirect and induced impacts related to construction are considered, biomass sites

TABLE 18. TOTAL ECONOMIC IMPACTS BY EMC

EMC	Employment	Income	Output
Central Georgia EMC	2,668.3	$116,867,351	$324,092,755
Cobb EMC	8,675.9	$476,152,875	$1,211,899,469
Pataula EMC	171.4	$6,886,458	$23,927,000
Snapping Shoals EMC	4,755.8	$220,482,878	$614,491,759
Upson County EMC	378.5	$15,636,449	$48,393,937
Washington EMC	734.7	$27,640,165	$85,305,354
Total	**17,384.6**	**$863,666,176**	**$2,308,110,274**

Conclusion

The implementation of energy efficiency measures for residential, commercial and industrial customers could produce nearly 23 million MWh in electricity savings and a peak load reduction equivalent of 548 MW in the Power4Georgians region. The cost of implementing these measures would cost $1.4 billion over 14 years, or an average of $.06 per kWh – significantly less than the projected costs of electricity from Plant Washington.

In addition to providing energy savings for customers, the implementation of energy efficiency measures would also generate significant economic impact in the area. The investment of $1.4 billion in energy efficiency would generate 17,384 years of employment, or an average of 1,241 jobs per year for 14 years, and $3.1 billion in economic activity in the areas served by the six Power 4 Georgians EMCs.

have the potential to create 17 jobs for every $1 million in investment, almost three times the employment effect of coal-fired power plants (Political Economy Research Institute, *The Economic Benefits of Investing in Clean Energy*, June 2009).