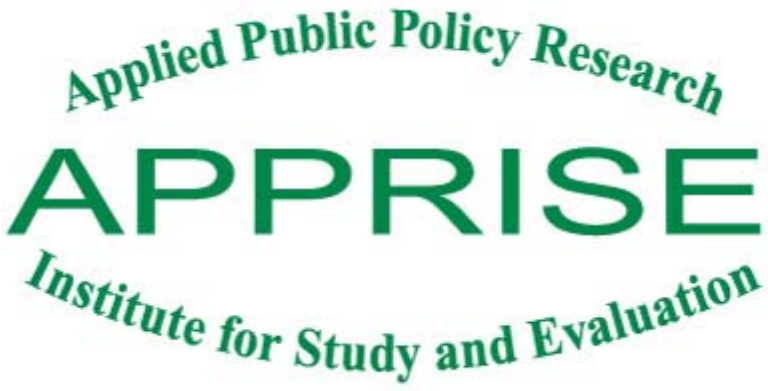

Low Income Customer Assistance Program

Impacts on Energy Usage

Prepared for Niagara Mohawk

February 2002

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Executive Summary

Approximately one third of Niagara Mohawk's customers are low-income[1]. These customers have had increasing problems paying their bills, and Niagara Mohawk has seen an increasing level of arrears and write-offs from this population. Niagara Mohawk initiated the Low-Income Customer Assistance Program (LICAP) in November 1993 to address the business problems associated with serving low-income payment-troubled customers. The goal of the LICAP Afford/Ability program is to provide cost-effective solutions to the substantial "inability to pay" problem among Niagara Mohawk's low-income customers. The program couples a reduced payment with energy services that are designed to reduce usage and increase affordability.

The LICAP Program was designed to address the problems of low-income customers who are unable to pay their full energy bills. Payment-troubled customers may receive, as appropriate, any or all of the following LICAP services: a) an affordable payment arrangement, b) energy use management education, c) a variety of energy efficiency services including weatherization and energy efficient appliance replacements. By increasing the overall amount of cash payments, as a result of being on an affordable payment arrangement, and by reducing household energy usage, as a result of any energy use management education and/or energy efficiency services received, payment troubled LICAP customers can substantially increase bill payment coverage rates.

The current report and previous reports comprise a "cohort study". The population examined in this study is all households that enrolled in the Afford/Ability program between October 26, 1998 and December 31, 1998. There were 704 households enrolled in the program during this time period. Households differ widely in terms of the number of days of billing data available. All analyses are presented initially with the full set of households. Subsequent analyses restrict the households to those with at least 6 actual bills and at least 2 actual bills during the heating season.

The analyses that are performed in this report are:

- Analysis of data quality: There were 704 households who enrolled in the LICAP program in the fall of 1998. However,

[1] Source: 1990 Census.

all analyses cannot be performed on this full set of households, due to missing data items. This section of the report describes the set of households with data available to conduct analysis, and the data that are missing for households that are not included in the analysis.

- Analysis of billing data and energy usage: This section of the report compares billing data available in the baseline and follow-up periods. This section also compares annualized and weather-normalized usage data.

- Analysis of energy savings: This section of the report analyzes changes in weather normalized energy usage by the type of energy services received.

- Analysis of cost-effectiveness: This section of the report compares the energy usage reductions to the cost of providing the services in order to compute the cost-effectiveness of the services.

- Other impacts of energy services: This section of the report analyzes the impact of energy services on coverage rates and changes in level of arrearages.

Data Quality

This report analyzes data for the 704 households that enrolled in the LICAP program between October 26, 1998 and December 31, 1998. The baseline period for data analysis was January 1, 1998 through December 31, 1998. The follow-up period for data analysis was June 1, 1999 through June 30, 2000. Due to conversion to a new billing system in February, 1999, problems with billing and data were experienced during this time period.

The table below shows that there were 704 households that enrolled in the LICAP program in the fall of 1998. Of these households, 702 were able to be matched with the premise number from the new billing system, and 687 were able to be matched with the follow-up data.

Households with Account Information

Number in Cohort	704
Number with New Premise Number	702
Number with Follow-up Account Information Matched	687

While 687 of the LICAP households were found in the follow-up data, many of these households did not have usage information available. Of the original 702 households, 621 had usage data available in the baseline year. Of the 621 households with usage data in the baseline year, 447 had usage data available in the follow-up year. This is the sample designated as "full sample" in this report. The sample designated as "restricted sample" in this report had at least 6 non-estimated usage periods and at least 2 non-estimated heating periods. The table below shows that 428 households had at least 6 usage periods, but only 198 had at least 6 non-estimated usage periods. Of these households, 120 had at least 2 non-estimated heating periods.

Households with Usage Information

Baseline	621
Follow-up: "Full Sample"	447
Baseline and follow-up usage data with at least 6 usage periods	428
Baseline and follow-up usage data with at least 6 non-estimated bills	198
Baseline and follow-up usage data with at least 6 non-estimated bills at least 2 non-estimated heating bills: "Restricted Sample"	120

Estimated Savings

The Niagara Mohawk LICAP program aims to reduce the household's energy usage through the delivery of energy education and energy efficiency services. In this report, we examine changes in weather normalized energy usage by the type of energy services received.

The table below displays energy savings for combination and electric non-heating households that attended the workshop and those that attended the workshop and received weatherization services. Workshop recipients

show a net change of approximately 7 percent for the full sample, but this change is not statistically significant. A larger sample may have shown statistically significant results.

Estimated Savings from Workshop

WORKSHOP SAVINGS										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Combination and Electric Non-heating	kWh	Full	Workshop only and Workshop and Weatherization	Baseload	Participants	133	7773	7684	90 (±371)	1.2%
					Comparison	129	7730	8154	-424 (±462)	-5.5%
					Net				513 (±590)	6.6%

The next table displays savings for combination households that received weatherization and video or weatherization and workshop treatments. The net savings for the full sample is 20 percent (statistically significant at the 99 percent level).

Estimated Savings from Weatherization

WEATHERIZATION SAVINGS (Costs over $365)										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Combination	Therms	Full	Weatherization and Video or Weatherization and Workshop	Prism	Participants	13	1530	1295	235** (±121)	15.4%
					Comparison	34	1217	1283	-66 (±88)	-5.4%
					Net				301** (±146)	19.7%

The table below displays savings for households that received AEP and the video. The net change is approximately 23 percent (statistically significant at the 99 percent levels) of pre-program usage.

Estimated Savings from AEP and Video

AEP and Video SAVINGS (Costs over $200)										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Combination and Electric Non-heating	kWh	Full	AEP and Video	Baseload	Participants	52	10,848	8747	2101** (±951)	19.4%
					Comparison	129	7730	8154	-424 (±462)	-5.5%
					Net				2525** (±1053)	23.3%

The next table displays savings for AEP and workshop recipients. The net changes is approximately 33 percent of pre-program usage (significant at the 99 percent level).

Estimated Savings from AEP and Workshop

AEP and Workshop Savings (Costs over $200)										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Combination and Electric Non-heating	kWh	Full	AEP and Workshop	Baseload	Participants	27	9781	6962	2818** (±1619)	28.8%
					Comparison	129	7730	8154	-424 (±462)	-5.5%
					Net				3242** (±1678)	33.1%

The table below displays savings for electric heating households that received the AEP and video or the AEP and the workshop. The net change is 2.5 percent of pre-program usage.

Estimated Savings from AEP and Video or AEP and Workshop Electric Heating Households

AEP andVideo or AEP and Workshop SAVINGS (Costs over $200)										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Electric Heating	kWh	Full	AEP and Video or AEP and Workshop	Prism	Participants	3	18,244	17,167	1077 (±2145)	5.9%
					Comparison	12	11,637	11,014	622 (±940)	5.3%
					Net				454 (±1880)	2.5%

In summary, AEP savings are larger than weatherization savings. Workshop participants have reduced usage, but their change is not statistically significant. A larger sample may have shown a statistically significant change.

Cost Effectiveness

This report discusses estimated usage reductions from the receipt of energy education and efficiency services. Calculated savings are compared to the cost of providing the services, in order to compute the cost-effectiveness of the services.

The table below calculates the simple payback in years for weatherization services given the estimated savings calculated above. The table uses an

estimated retail cost of 14 cents per kWh and 83 cents per Therm. This table shows that for the full sample receiving weatherization services, the estimated simple payback is 5.8 years.

Cost-Effectiveness Analysis
Weatherization (with Video or Workshop)[2]

Customer Type	Sample	Net Savings (Therms)	Annual Retail Cost Savings	Mean Cost of Weatherization and Workshop Services	Payback (Years)
Combination	Full	301	$250	$1451	5.8

The table below displays the calculated simple payback of utility costs for customer savings for those receiving AEP services. This table shows that the payback for combination households receiving AEP and video or AEP and workshop is between 1.9 and 2.5 years.

Cost-Effectiveness Analysis
AEP[3]

Customer Type	Sample	Services	Net Savings (kWh)	Annual Retail Cost Savings	Mean Cost of AEP and Workshop Services	Payback (Years)
Combination and Electric Non-heating	Full	AEP and Video	2525	$354	$871	2.5
Combination and Electric Non-heating	Full	AEP and Workshop	3242	$454	$865	1.9

The table below displays the cost-effectiveness analysis for workshop recipients. The estimated payback for the full sample is 0.7 years.

[2] This analysis assumes a $52 cost for workshops (including 3 CFL's) and a $217 cost for administrative staff time. Contracted costs have been calculated as mean contracted costs for these program participants.
[3] This analysis assumes a $52 cost for workshops (including 3 CFL's) and a $81 cost for administrative staff time. Contracted costs have been calculated as mean contracted costs for these program participants.

Cost-Effectiveness Analysis
Workshop[4]

Customer Type	Sample	Net Savings (kWh)	Annual Retail Cost Savings	Mean Cost of Workshop Services	Payback (Years)
Combination and Electric Non-heating	Full	513	$72	$52	0.7

Impacts on Coverage Rates and Arrearages

The reduction in usage that results from the receipt of energy education and efficiency services should reduce energy bills, increase bill coverage rates, and reduce arrears. This section examines the change in coverage rates and arrearages by the type of energy services received.

The table below displays cash and total coverage rates in the baseline and follow-up periods by type of service received. This table shows that households that received AEP services had an 26 percentage point increase in cash coverage rates (significant at the 99 percent level), houesholds that received weatherization services had a 16 percentage point increase in cash coverage rates (not statistically significant) and households that only received education had a 8 to 9 percentage point increase in cash coverage rates (statistically significant at the 95 percent level.) Total coverage rates increased significantly for households that received AEP services.

Coverage Rates
Full Sample

Service Received	Cash Coverage Rates			Total Coverage Rates		
	Baseline	Follow-Up	Change	Baseline	Follow-Up	Change
Weatherization	54%	69%	16%	75%	87%	12%
AEP	57%	83%	26%	77%	97%	20%
Workshop Only	48%	57%	9%	75%	80%	5%
Video Only	52%	60%	8%	78%	83%	5%

The table below displays the distribution of the change in arrears by the level of energy services received. This table shows that households that

[4] This analysis assumes a $52 cost for workshops (including 3 CFL's).

received weatherization or AEP services are more likely to have a decrease in arrears of $100 or more than those households that only received energy education. While 46 percent of households that received weatherization and 56 percent of households that received AEP services experienced a $100 or more decline in arrears, only 36 percent of households that only received the workshop and 37 percent of households that only received the video experienced this decline. Additionally, households that received weatherization or AEP services are less likely to experience an increase of $500 or more in arrears.

Distribution of Change in Arrears
By Level of Service Received
Full Sample

Change in Arrears	Energy Services Received			
	Weatherization	**AEP**	**Workshop Only**	**Video Only**
< -$100	46%	56%	36%	37%
-$100 to $100	8%	16%	14%	13%
+$100 to +$500	25%	13%	20%	18%
> +$500	21%	16%	30%	32%
Total	100%	100%	100%	100%

I. Introduction

Approximately one third of Niagara Mohawk's customers are low-income[5]. These customers have had increasing problems paying their bills, and Niagara Mohawk has seen an increasing level of arrears and write-offs from this population. Niagara Mohawk initiated the Low-Income Customer Assistance Program (LICAP) in November 1993 to address the business problems associated with serving low-income payment-troubled customers. The goal of the LICAP Afford/Ability program is to provide cost-effective solutions to the substantial "inability to pay" problem among Niagara Mohawk's low-income customers. The program couples a reduced payment with energy services that are designed to reduce usage and increase affordability.

A. Afford/Ability Plan Description

The LICAP Program was designed to address the problems of low-income customers who are unable to pay their full energy bills. Payment-troubled customers may receive, as appropriate, any or all of the following LICAP services: a) an affordable payment arrangement, b) energy use management education, c) a variety of energy efficiency services including weatherization and energy efficient appliance replacements. By increasing the overall amount of cash payments, as a result of being on an affordable payment arrangement, and by reducing household energy usage, as a result of any energy use management education and/or energy efficiency services received, payment troubled LICAP customers can substantially increase bill payment coverage rates.

1. Target Customers, Eligibility Criteria, and Program Requirements

The overall goal of the Afford/Ability program is to furnish non-PA low-income payment-troubled LIHEAP-recipient customers with a long-term solution to payment problems in a way that is cost-effective for Niagara Mohawk. Another objective of the program is to interrupt the troubled payment cycle of broken agreements, shutoff, partial payment, resumption of service, further broken agreement, and shutoff once again. The program

[5] Source: 1990 Census.

is available to customers who are eligible for HEAP but are above the Public Assistance Need Standard.

Eligibility requirements are:

- Income Limit: Customers must have income that is not above the LIHEAP standard.

- Cash Flow: Monthly income must not exceed monthly expenses by more than $100. Negative cash flow cannot be greater than 50 percent of monthly income.

- Public Assistance: Customers must not be on cash Public Assistance. (The exception is the Child Assistance Program.)

- Payment-Troubled Status: The applicant must have a payment troubled history. The normal criterion is two broken agreements in the past 12 months, but exceptions are sometimes made.

2. Overview of Afford/Ability Program Design

The Afford/Ability design consists of three basic implementation components: (1) referral of all eligible customers for enrollment; (2) confirmation of customer eligibility and enrollment; (3) delivery of energy management services. Each of the components is described below.

1. Referral

The goal of the referral process is to direct payment-troubled customers who are potentially eligible for the Afford/Ability Plan to the intake representatives. The referral process is successful if it generates an adequate number of screened and eligible referrals for the intake representatives. A longer-term objective is that the referral process ensures that all customers who are eligible be offered the opportunity to enroll in the program. Referrals for potential participants come from a variety of sources including Collections Services representatives and consumer advocates.

2.

Enrollment

The purpose of the enrollment process is to confirm the customer's eligibility status, to work with the customer to negotiate an affordable payment amount for those customers going on the affordable payment arrangement, to identify the best EMS option, and to explain the various program requirements to the customer. Enrollment is a key contact with the customer. The intake representative must simultaneously change the customer's attitude toward Niagara Mohawk, negotiate aggressively with the customer to ensure that the customer is meeting his or her responsibility, and explain complex program procedures.

3. Energy Management Services

Energy services are an integral part of the Afford/Ability program and of the affordability strategy. The Afford/Ability program is targeted to those customers who cannot pay their utility bills. A prior study found that over half of Niagara Mohawk's HEAP customers had moderate to high usage that contributed to the inability to pay. The goal of the negotiated partial payment is to obtain more frequent and higher total payments from customers. The aim is to reduce the gap between usage and payment. By providing customers with energy management services, Niagara Mohawk hopes to further decrease payment shortfalls to the point where customers can afford their entire bill. There are two parts to the energy services component of the program:

- Energy Use Management Education works with customers to identify their usage patterns and potential areas for saving.

- Energy Efficiency Services offer customers the opportunity to improve their housing stock and update appliances in ways that will reduce their energy consumption.

B. Population Studied

The current report and previous reports comprise a "cohort study". The population examined in this study is all households that enrolled

in the Afford/Ability program between October 26, 1998 and December 31, 1998. There were 704 households enrolled in the program during this time period.

Households differ widely in terms of the number of days of billing data available. All analyses are presented initially with the full set of households, the "Full Sample". Subsequent analyses restrict the households to those with at least 6 actual bills and at least 2 actual bills during the heating season, the "Restricted Sample".

C. Analyses Performed

The analyses that are performed in this report are described below:

- Analysis of data quality: There were 704 households who enrolled in the LICAP program in the fall of 1998. However, all analyses cannot be performed on this full set of households, due to missing data items. This section of the report describes the set of households with data available to conduct analysis, and the data that are missing for households that are not included in the analysis.

- Analysis of billing data and energy usage: This section of the report compares billing data available in the baseline and follow-up periods. This section also compares annualized and weather-normalized usage data.

- Analysis of energy savings: This section of the report analyzes changes in weather normalized energy usage by the type of energy services received.

- Analysis of cost-effectiveness: This section of the report compares the energy usage reductions to the cost of providing the services in order to compute the cost-effectiveness of the services.

- Other impacts of energy services: This section of the report analyzes the impact of energy services on coverage rates and changes in the level of arrearages.

- Impacts on payments and coverage rates: The accompanying report, Impacts on Payments and Coverage Rates, analyzes

changes in number of payments, level of cash payments, level of assistance payments, and total payments. Bill coverage rates are also analyzed.

- Analysis of baseline data: The Baseline Analysis Report examined baseline customer characteristics, negotiated payments and coverage rates, baseline usage and bills, baseline payments, and projected program outcomes.

- Predicted impacts of energy services: The Energy Services Analysis Report examined the energy services that were received through the LICAP program, the projected savings from these services, and the impact of predicted usage reductions on bills, negotiated coverage rates, and actual coverage rates.

D. Layout of the Report

This report is comprised of six parts. Section II describes the number of households with data available to be analyzed. Section III describes billing data and energy usage. Section IV discusses energy savings by type of energy services received. Section V analyzes cost effectiveness of the energy services. Section VI analyzes the impact of energy services on coverage rates and arrearages. Section VII summarizes the findings from the analysis of follow-up data.

II. Data Quality

This report analyzes data for the 704 households that enrolled in the LICAP program between October 26, 1998 and December 31, 1998. The baseline period for data analysis was January 1, 1998 through December 31, 1998. The follow-up period for data analysis was June 1, 1999 through June 30, 2000. Due to conversion to a new billing system in February, 1999, problems with billing and data were experienced during this time period. This section of the report analyzes the level of data available for the cohort studied.[6]

Table II-1 shows that there were 704 households that enrolled in the LICAP program in the fall of 1998. Of these households, 702 were able to be matched with the premise number from the new billing system, and 687 were able to be matched with the follow-up data.

Table II-1
Households with Account Information

Number in Cohort	704
Number with New Premise Number	702
Number with Follow-up Account Information Matched	687

While 687 of the LICAP households were found in the follow-up data, many of these households did not have usage information available. Of the original 702 households, 621 had usage data available in the baseline year. Of the 621 households with usage data in the baseline year, 447 had usage data available in the follow-up year. This is the sample designated as "full sample" in this report. The sample designated as "restricted sample" in this report had at least 6 non-estimated usage periods and at least 2 non-estimated heating periods. Table II-2 shows that 428 households had at least 6 usage periods, but only 198 had at least 6 non-estimated usage periods. Of these households, 120 had at least 2 non-estimated heating periods.

[6] Data problems that were experienced were due largely to the transition to the new data systems.

Table II-2
Households with Usage Information

Baseline	621
Follow-up: "Full Sample"	447
Baseline and follow-up usage data with at least 6 usage periods	428
Baseline and follow-up usage data with at least 6 non-estimated bills	198
Baseline and follow-up usage data with at least 6 non-estimated bills at least 2 non-estimated heating bills: "Restricted Sample"	120

III. Billing Data and Energy Usage

The number of days of billing data varies for households due to billing cycles, customer moves, and data systems. It is important to be aware of the number of days of billing data when comparing usage across time and when normalizing data. This section of the report compares billing data available in the baseline and follow-up periods. This section also compares annualized and weather normalized usage data.

The number of days of billing data available is displayed in Table III-I. This table shows that there are fewer days of billing data available in the follow-up period than in the baseline period. In the baseline period, 68 percent of households had at least 350 days of data available, and in the follow-up period, only 4 percent of households have this level of data availability. Most households in the follow-up period had 300 to 324 days of billing data available.

Table III-1
Availability of Billing Data

Days of Billing Data Available	Baseline Data		Follow-Up Data	
	Full Sample	Restricted Sample	Full Sample	Restricted Sample
<200	2%	0%	6%	0%
200-299	6%	8%	7%	5%
300-324	9%	3%	76%	84%
325-349	16%	23%	7%	7%
350-374	54%	57%	4%	4%
375 or more	14%	10%	0%	0%

In the next section, we will analyze estimated changes in weather normalized usage data. It is also important to examine the impact of the weather normalization process on the data. Table III-2 displays non-normalized annualized and weather normalized energy usage by type of account for the full sample and the restricted sample and for the baseline and follow-up periods. Non-normalized usage for combination electric accounts is approximately 7000 kWh, and weather normalized usage is

approximately 7500 kWh. There are large differences between the non-normalized and weather normalized usage. These differences vary in size and direction due to different periods of available data for the different groups of customers.

Table III-2
Comparison of Normalized and Non-Normalized Usage

Customer Type	Sample	Period	Days of Usage Data	Non-Normalized Annualized Usage	Weather Normalized Usage
Combination – Electric (kWh)	Full	Pre	337	7035	7494
Combination – Electric (kWh)	Full	Post	293	7026	7489
Combination – Electric (kWh)	Restricted	Pre	345	7031	7486
Combination – Electric (kWh)	Restricted	Post	307	7233	7739
Combination – Gas (Therms)	Full	Pre	339	1133	1292
Combination – Gas (Therms)	Full	Post	301	1316	1292
Combination – Gas (Therms)	Restricted	Pre	341	1281	1468
Combination – Gas (Therms)	Restricted	Post	308	1483	1439
Electric Heating – Electric (kWh)	Full	Pre	344	11952	13917
Electric Heating – Electric (kWh)	Full	Post	292	13287	12523
Electric Heating – Electric (kWh)	Restricted	Pre	322	10211	12713
Electric Heating – Electric (kWh)	Restricted	Post	303	12817	12169
Electric Non-Heating – Electric (kWh)	Full	Pre	343	8549	9325
Electric Non-Heating – Electric (kWh)	Full	Post	276	8498	8744
Electric Non-Heating – Electric (kWh)	Restricted	Pre	360	7671	8327
Electric Non-Heating – Electric (kWh)	Restricted	Post	309	6827	6806

IV. Estimated Savings

The Niagara Mohawk LICAP program aims to reduce the household's energy usage through the delivery of energy education and energy efficiency services. In this section of the report, we examine changes in weather normalized energy usage by the type of energy services received.

Table IV-1 displays energy savings for combination and electric non-heating households that attended the workshop and those that attended the workshop and received weatherization services. The savings estimate for the full sample is 90 kWh, and the savings estimate for the restricted sample is 144 kWh. The group of households that only received a video is used as a comparison group. The full comparison group shows an increase of 424 kWh and the restricted comparison group shows a increase of 40 kWh. Workshop recipients show a net change of approximately 7 percent for the full sample and 3 percent for the restricted sample, but this change is not statistically significant.[7] A larger sample may have shown statistically significant results.

Table IV-1
Estimated Savings from Workshop

WORKSHOP SAVINGS										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Combination and Electric Non-heating	kWh	Full	Workshop only and Workshop and Weatherization	Baseload	Participants	133	7773	7684	90 (±371)	1.2%
					Comparison	129	7730	8154	-424 (±462)	-5.5%
					Net				513 (±590)	6.6%
Combination and Electric Non-heating	kWh	Restricted	Workshop only and Workshop and Weatherization	Baseload	Participants	43	7103	6959	144 (±676)	2.0%
					Comparison	34	7935	7974	-40 (±1124)	-0.5%
					Net				184 (±1299)	2.6%

[7] The fact that the change is not statistically significant means that the estimate may not be reliable. A larger group of households would have to be analyzed to determine if this is a good estimate of savings. However, this does not imply that the savings that are estimated are not important for the customers in terms of making their bills more affordable.

Table IV-2 displays savings for combination households that received weatherization and video or weatherization and workshop treatments, with at least $365 spent on the weatherization. The full sample of these households had a mean savings of 235 therms (significant at the 99 percent level) and the restricted sample had a mean savings of 165 therms. Again, the group of households that only received the video is used as a comparison group. The net savings for the full sample is 20 percent (statistically significant at the 99 percent level) and the net savings for the restricted sample is 12 percent.

Table IV-2
Estimated Savings from Weatherization

WEATHERIZATION SAVINGS (Costs over $365)										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Combination	Therms	Full	Weatherization and Video or Weatherization and Workshop	Prism	Participants	13	1530	1295	235** (±121)	15.4%
					Comparison	34	1217	1283	-66 (±88)	-5.4%
					Net				301** (±146)	19.7%
Combination	Therms	Restricted	Weatherization and Video or Weatherization and Workshop	Prism	Participants	4	1613	1448	165 (±213)	10.2%
					Comparison	16	1385	1407	-22 (±173)	-1.6%
					Net				187 (±240)	11.6%

Table IV-3 displays savings for households that received AEP and the video, where AEP costs are at least $200. The full sample of these households had a mean savings of 2101 kWh (statistically significant at the 99 percent level) and in the restricted sample there was a mean savings of 2000 kWh (statistically significant at the 99 percent level). The net changes are approximately 23 percent (statistically significant at the 99 and 95 percent levels) of pre-program usage.

Table IV-3
Estimated Savings from AEP and Video

AEP and Video SAVINGS (Costs over $200)										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Combination and Electric Non-heating	kWh	Full	AEP and Video	Baseload	Participants	52	10,848	8747	2101** (±951)	19.4%
					Comparison	129	7730	8154	-424 (±462)	-5.5%
					Net				2525** (±1053)	23.3%
Combination and Electric Non-heating	kWh	Restricted	AEP and Video	Baseload	Participants	10	8734	6734	2000** (±999)	22.9%
					Comparison	34	7935	7974	-40 (±1124)	-0.5%
					Net				2039* (±1452)	23.3%

Table IV-4 displays savings for AEP and workshop recipients, where AEP costs were at least $200. Savings are 2818 kWh for the full sample (statistically significant at the 99 percent level) and 1652 kWh in the restricted sample (statistically significant at the 99 percent level). The net changes are approximately 33 and 20 percent (statistically significant at the 99 and 95 percent levels) of pre-program usage.

Table IV-4
Estimated Savings from AEP and Workshop

AEP and Workshop Savings (Costs over $200)										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Combination and Electric Non-heating	kWh	Full	AEP and Workshop	Baseload	Participants	27	9781	6962	2818** (±1619)	28.8%
					Comparison	129	7730	8154	-424 (±462)	-5.5%
					Net				3242** (±1678)	33.1%
Combination and Electric Non-heating	kWh	Restricted	AEP and Workshop	Baseload	Participants	8	8406	6754	1652** (±581)	19.7%
					Comparison	34	7935	7974	-40 (±1124)	-0.5%
					Net				1692* (±581)	20.1%

Table IV-5 displays savings for electric heating households that received the AEP and video or the AEP and the workshop, where AEP costs are at least $200. Savings for electric heating households that received AEP and the workshop or AEP and the video are 1077 kWh. The net change is 2.5

percent of pre-program usage. There are no households in the restricted sample.

Table IV-5
Estimated Savings from AEP and Video or AEP and Workshop
Electric Heating Households

AEP andVideo or AEP and Workshop SAVINGS (Costs over $200)										
Customer Type	**Units**	**Sample**	**Services Received**	**Analysis Type**	**Group**	**# Cases**	**Pre**	**Post**	**Savings**	**% Total**
Electric Heating	kWh	Full	AEP and Video or AEP and Workshop	Prism	Participants	3	18,244	17,167	1077 (±2145)	5.9%
					Comparison	12	11,637	11,014	622 (±940)	5.3%
					Net				454 (±1880)	2.5%

In summary, changes in usage for the full sample tend to be larger and are more likely to be statistically significant than changes for the restricted sample. AEP savings are larger than weatherization savings. Workshop participants have reduced usage, but their change is not statistically significant. A larger sample may have shown a statistically significant change.

V. Cost Effectiveness Analysis

The previous section of this report examined estimated usage reduction from the receipt of energy education and efficiency services. In this section, we compare these savings to the cost of providing the services, in order to compute the cost-effectiveness of the services.

Table V-1 calculates the simple payback in years for weatherization services given the estimated savings calculated above. The table uses an estimated retail cost of 14 cents per kWh and 83 cents per Therm. This table shows that for the full sample receiving weatherization services, where costs were greater than $365, the estimated simple payback is 5.8 years. The annual cost savings compares to the predicted $111 savings for weatherization/video and $234 for weatherization/ workshop (estimated in an earlier report). The estimated simple payback, given the savings for the restricted sample, is 9.9 years for those in the restricted sample with weatherization costs over $365.

Table V-1
Cost-Effectiveness Analysis
Weatherization (with Video or Workshop)[8]

Customer Type	Sample	Net Savings (Therms)	Annual Retail Cost Savings	Mean Cost of Weatherization and Workshop Services	Payback (Years)
Combination	Full	301	$250	$1451	5.8
Combination	Restricted	187	$155	$1541	9.9

Table V-2 displays the calculated simple payback of utility costs for customer savings for those receiving AEP services. This table shows that the payback for combination households receiving AEP and video, where AEP costs are at least $200, is between 2.5 and 3.1 years. Households receiving AEP and workshop had a payback of 1.9 and 3.5 years for the full and restricted samples receiving these services with AEP costs over $200. The savings shown here compare to the $98 savings estimated in the

[8] This analysis assumes a $52 cost for workshops (including 3 CFL's) and a $217 cost for administrative staff time. Contracted costs have been calculated as mean contracted costs for these program participants.

earlier report for those receiving AEP and the video and $186 savings for those receiving AEP and the workshop.

Table V-2
Cost-Effectiveness Analysis
AEP[9]

Customer Type	Sample	Services	Net Savings (kWh)	Annual Retail Cost Savings	Mean Cost of AEP and Workshop Services	Payback (Years)
Combination and Electric Non-heating	Full	AEP and Video	2525	$354	$871	2.5
Combination and Electric Non-heating	Restricted	AEP and Video	2039	$285	$872	3.1
Combination and Electric Non-heating	Full	AEP and Workshop	3242	$454	$865	1.9
Combination and Electric Non-heating	Restricted	AEP and Workshop	1692	$237	$829	3.5

Table V-3 displays the cost-effectiveness analysis for workshop recipients. The estimated payback for the full sample is 0.7 years and the estimated payback for the restricted sample is 2 years. The savings shown here compare to the $75 in savings estimated in an earlier report.

V-3
Cost-Effectiveness Analysis
Workshop[10]

Customer Type	Sample	Net Savings (kWh)	Annual Retail Cost Savings	Mean Cost of Workshop Services	Payback (Years)
Combination and Electric Non-heating	Full	513	$72	$52	0.7
Combination and Electric Non-heating	Restricted	184	$26	$52	2.0

[9] This analysis assumes a $52 cost for workshops (including 3 CFL's) and a $81 cost for administrative staff time. Contracted costs have been calculated as mean contracted costs for these program participants.
[10] This analysis assumes a $52 cost for workshops (including 3 CFL's).

VI. Impacts on Coverage Rates and Arrears

The reduction in usage that results from the receipt of energy education and efficiency services should reduce energy bills, increase bill coverage rates, and reduce arrears. This section examines the change in coverage rates and arrearages by the type of energy services received.

The LICAP program provides targeted efficiency services to participants in order to reduce their energy usage and make energy bills more affordable. Table VI-1 displays cash and total coverage rates in the baseline and follow-up periods by type of service received. This table shows that households that received AEP services had a 26 percentage point increase in cash coverage rates (significant at the 99 percent level), houesholds that received weatherization services had a 16 percentage point increase in cash coverage rates[11] and households that only received education had a 8 to 9 percentage point increase in cash coverage rates (statistically significant at the 95 percent level.) Total coverage rates increased significantly for households that received AEP services.

Table VI-1
Coverage Rates
Full Sample

Service Received	Cash Coverage Rates			Total Coverage Rates		
	Baseline	Follow-Up	Change	Baseline	Follow-Up	Change
Weatherization	54%	69%	16%	75%	87%	12%
AEP	57%	83%	26%	77%	97%	20%
Workshop Only	48%	57%	9%	75%	80%	5%
Video Only	52%	60%	8%	78%	83%	5%

The receipt of energy services and energy education should help participant households to reduce their arrears, as these services should reduce energy usage and the total bill. Table VI-2 displays the distribution of the change in arrears by the level of energy services received. This

[11] This difference is not statistically significant due to the small sample size. Development of data on a larger number of cases would be needed to confirm this finding.

table shows that households that received weatherization or AEP services are more likely to have a decrease in arrears of $100 or more than those households that only received energy education. While 46 percent of households that received weatherization and 56 percent of households that received AEP services experienced a $100 or more decline in arrears, only 36 percent of households that only received the workshop and 37 percent of households that only received the video experienced this decline. Additionally, households that received weatherization or AEP services are less likely to experience an increase of $500 or more in arrears.

Table VI-2
Distribution of Change in Arrears
By Level of Service Received
Full Sample

Change in Arrears	Energy Services Received			
	Weatherization	AEP	Workshop Only	Video Only
< -$100	46%	56%	36%	37%
-$100 to $100	8%	16%	14%	13%
+$100 to +$500	25%	13%	20%	18%
> +$500	21%	16%	30%	32%
Total	100%	100%	100%	100%

Table VI-3 displays the distribution of the change in arrears by whether the household had energy savings of at least 10 percent.[12] This table shows that households that experience significant energy savings are more likely to experience a decline of $100 or more in arrears. While over half of households with significant energy savings have their arrears decline by $100 or more, only one third of households that did not experience significant energy savings see their arrears decline by this amount. Households with significant energy savings are also less likely to experience a $500 or more increase in arrears.

[12] Combination households are defined to have significant energy savings if they experience gas or electric savings of at least 10 percent.

Table VI-3
Distribution of Change in Arrears
By Whether the Household Had Significant Energy Savings
Full Sample

Change in Arrears	Significant Energy Savings	
	Yes	No
< -$100	53%	33%
-$100 to $100	16%	13%
+$100 to +$500	17%	20%
> +$500	15%	34%
Total	100%	100%

VII. Findings

This report examined the impact of the Niagara Mohawk LICAP program on a cohort of households that enrolled in the program in the fall of 1998. This report focused on the effect of the program on the energy savings and cost effectiveness of services received. The main findings were as follows:

1. Data quality: The original cohort consisted of 704 households who had enrolled in LICAP in the fall of 1998. The analysis groups in this report were 447 households who had usage data for the baseline and follow-up periods, and 120 households who had at least 6 non-estimated bills and at least 2 non-estimated heating bills. There are two main causes of sample attrition. The first is the lack of availability of usage data for many participants in the follow-up period. The second is the large number of estimated bills.

2. Energy Usage: Estimated AEP savings, ranging from 20 percent to 33 percent, are higher than weatherization savings, ranging from 12 to 20 percent. Estimated workshop savings range from 3 to 7 percent.

3. Cost Effectiveness: AEP services appear to be the most cost-effective. Customers who receive these services have a 1.9 year to 3.5 year simple payback of utility costs. Weatherization services are also found to be cost-effective. Workshop savings may prove to be cost effective with a larger analysis group.

4. Program Goals: The LICAP program appears to be achieving its goals. Participation in the program results in a reduction in energy consumption. Services are found to be cost-effective.

5. Remaining Questions/Challenges: There were measured workshop savings, but they were not found to be statistically significant. Analysis with a larger sample may show statistically significant savings.