

Inclusive Energy Efficiency Financing for Members of the French Broad Electric Membership Corporation

The Need for and Potential Benefits of An On-Bill Energy Efficiency Finance Program for Members, the Cooperative and Local Communities



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Executive Summary

The French Broad Electric Membership Corporation (EMC) provides electric service to all or part of four counties in North Carolina and two counties in Tennessee. In total the co-op serves more than 34,000 residential properties, of which only 25,300 are occupied and actively consuming electricity. The large majority of these meters are located in Madison (34 percent), Mitchell (33 percent), Buncombe (16 percent) and Yancey (14 percent) counties in North Carolina.

Among those communities, there is a substantial unmet need for home energy efficiency improvements. As illustrated in this report, addressing that need through an inclusive on-bill energy efficiency finance program, offered by French Broad EMC, would generate substantial benefits for co-op members, the co-op itself, and the local communities it serves.

This report details the level of need for energy efficiency investments in the French Broad EMC service area and provides a measure of the benefits that could be generated by a modest Pay As You Save on-bill energy efficiency program implemented by the co-op. Providing such a program would not only provide a valuable member service, it would also serve as an expression of French Broad EMC's commitment to the Seven Cooperative Principles—a set of principles upon which the co-op is founded.

The intent of this report is to highlight the important role that French Broad EMC can and should play in helping its members lower their energy costs while also contributing to the sustainable development of the communities it serves. The scale of the problem of energy waste in the co-op's service area is too substantial, and the resulting economic burden on the area's households too great, for the co-op not to take advantage of the opportunities and services available for developing such a program.

Key findings of the report are as follows:

Finding I: As many as half of all occupied households served by French Broad EMC need some level of energy efficiency improvements.

Notably, nearly one-quarter of all homes served by French Broad EMC are unoccupied, meaning that they are connected to the co-op's system but are not actively using energy. So while the co-op reports that there are more than 34,000 active residential meters, the high vacancy rate skews the actual energy costs the co-op reports for its members. Taking vacancies into account, we estimate that the actual number of occupied properties using energy is approximately 25,300 throughout the entirety of the service area.

An analysis of US Census data found that there are approximately 22,210 occupied housing units in three of the main counties served by the co-op: Madison, Mitchell and Yancey counties in North Carolina. Together, these three counties account for 81 percent of all households served by the co-op. Of these, 11,157 are more than 35 years old, suggesting that a significant number of these homes have poor or no insulation, are heated with old, inefficient heating systems and require other energy efficiency improvements.

Finding II: One-quarter of all housing units are renter-occupied, and the divergent interests of tenants and landlords dampen investment in needed energy improvements.

Because renters do not own the homes they live in, they are not likely to pay for needed energy improvements in order to lower their energy bills and make the home or apartment more comfortable. Nor are the property owners incentivized to invest in those improvements themselves because they receive none of the savings that accrue to the tenants.

Finding III: One in every four households served by French Broad EMC has a gross household income that falls below the federal poverty line.

Overall, the counties served by French Broad EMC have an average poverty rate of approximately 20 percent, which exceeds the state average of 16 percent. The area median incomes are also approximately 20 percent below the state average. Since most homes need new heating systems and insulation, the cost of making needed energy improvements can exceed \$5,000 in most cases. However, households living at or below the poverty line — and even many households that fall in the middle-income category — are unlikely to be able to afford needed energy improvements or access traditional financing on their own. Existing federal programs that provide bill payment and weatherization assistance fall far short of meeting the existing need.

Finding IV: Total energy costs for French Broad EMC members are unaffordable and higher than publicly recognized.

Despite public statements by French Broad EMC suggesting that its members enjoy lower-than-average home energy costs, this report finds that the opposite is true. On average, area households consumed 12,300 kilowatt-hours per home in 2015 and spent an estimated \$2,400 per home on heating and electricity costs in 2015. This represents an average of more than 6 percent of household income and exceeds the level that has been determined to be affordable for the average household. It is also more than double the national average.

We found that homes that are heated with electricity spend \$600 less than the average, and \$800 less than homes heated with non-electric heating sources, but account for only 32 percent of all occupied households. Homes heated with non-electric systems account for the large majority of households and spend an average of nearly \$300 more, resulting in energy costs exceeding 7 percent of household income. While this is high, the average energy cost burden for homes living in poverty in the French Broad EMC service area is even higher, ranging from 19.6 percent to 37 percent.

Table ES-1: Electricity and total energy costs for French Broad members in 2015

| Heating type | Number of homes | kWh per home | Electric bill | Non-electric heating bill | Total energy cost |
|---------------|-----------------|--------------|---------------|---------------------------|-------------------|
| Electric | 8,100 | 14,740 | \$1,840 | \$0 | \$1,840 |
| Non-electric | 17,200 | 11,160 | \$1,450 | \$1,227 | \$2,677 |
| Total/average | 25,300 | 12,100 | \$1,575 | | \$2,409 |

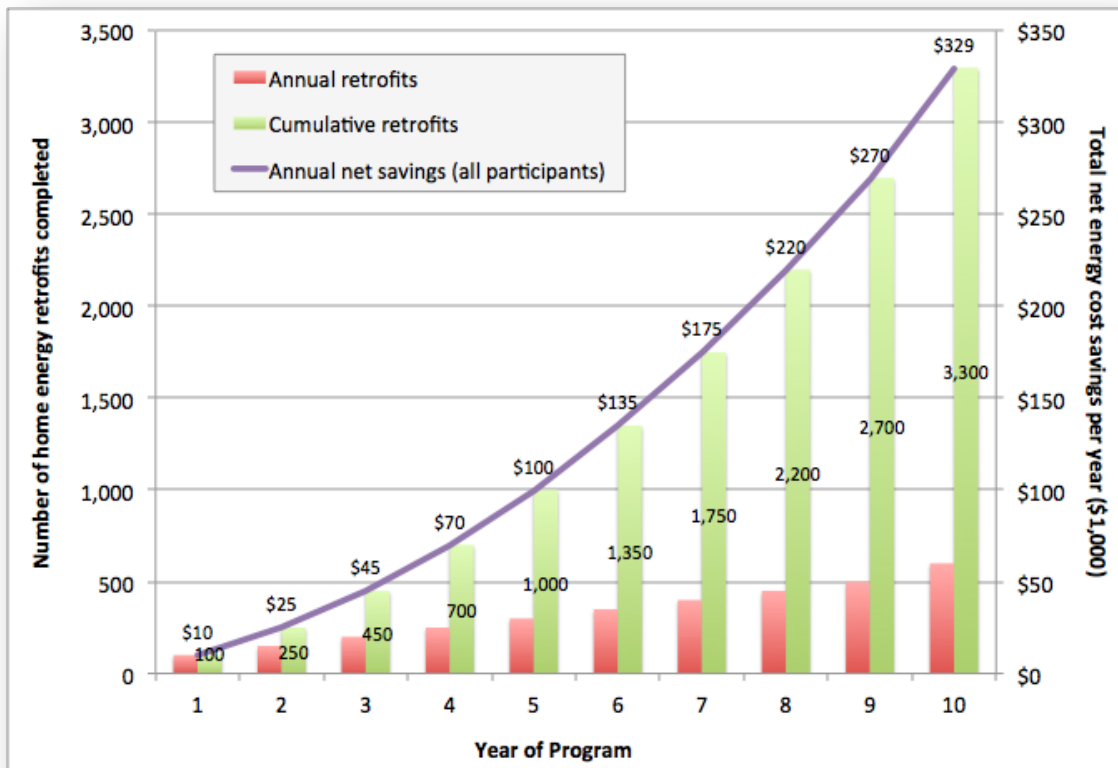
Finding V: An inclusive on-bill energy efficiency finance program would generate substantial benefits for residents, French Broad EMC and local economies.

We estimate that the average home participating in a French Broad on-bill finance program would save approximately \$100 a year on electricity costs alone, homes heating with non-electric sources would save even more. This represents the net savings after accounting for the co-op's cost recovery charge to pay for the energy efficiency investments. After year ten (the minimum cost-recovery term for existing programs), the resident would realize 100 percent of the savings, amounting to an estimated \$500 a year, on average. In total, the average annual savings for all participating households would grow to more than \$300,000 by year ten.

For French Broad EMC, lowering electricity demand would save the co-op money, thereby saving its members money, by helping keep costs and rates low. Based on information French Broad EMC provided on the demand charge the co-op pays Duke Energy, and using results on demand savings generated by other existing programs, we estimate that a modest on-bill finance program, starting at 100 homes retrofitted in year one and growing to 600 homes a year by year ten, would save the co-op more than \$1.1 million over the ten-year period.

Finally, assuming an average per-home investment of \$7,000, which is consistent with other existing on-bill finance programs, we estimate that a French Broad EMC program would generate \$23.1 million in new local investment over ten years, generating more than 20 jobs directly in home energy contracting services and 64 new jobs, overall.

Figure ES-1: Home energy projects completed (annual/cumulative), and total net cost savings



French Broad EMC can immediately take steps toward developing an inclusive on-bill energy efficiency finance program. The PAYS® model of inclusive on-bill financing has proven to be successful, cost-effective where it is offered. A total of 12 PAYS® (or similarly modeled) on-bill financing programs now exist throughout the Southeast, with five programs operating in South Carolina, five in East Kentucky, one in Arkansas and one in North Carolina, with other programs currently in development.

Because of this growth, co-ops interested in offering a PAYS® program to their members have a wealth of experience and resources to draw upon, and we hope that French Broad EMC will take advantage of that opportunity.

To conclude, given the level of need that exists among French Broad co-op members, the potential benefits to members, the co-op and local communities, and the wealth of resources and experience available to French Broad EMC for developing a program, Appalachian Voices recommends that French Broad EMC begin taking steps toward developing an inclusive on-bill energy efficiency finance program for its members, with a goal of having the program in place by Winter 2017.

Introduction

Background: Energy Savings for Appalachia

Appalachian Voices recognizes opportunities for increasing clean energy investment in rural communities, an aim aligned with our organizational mission of addressing the burden of energy costs for low-income households and strengthening rural economies. In 2013 we launched our Energy Savings for Appalachia program to leverage these opportunities. Our goal is to promote and assist in the development of on-bill energy efficiency financing programs at the 13 rural electric co-ops serving western North Carolina and East Tennessee. Achieving that goal could save residents and electric cooperatives millions of dollars in energy costs each year, generate tens of millions of dollars in new investment in rural economies and create hundreds of new local jobs.

In on-bill finance programs, the utility pays the full upfront cost of the energy efficiency upgrades and recovers that cost through an extra charge on the customer's bill each month, until the full cost of the upgrades has been recovered. In 2014, the US Department of Agriculture launched the Energy Efficiency and Conservation Loan Program (EECLP), which offers billion in low-interest loans annually for eligible rural electric utilities to develop new energy efficiency and renewable energy programs.¹ To date, the USDA has approved millions of EECLP dollars for electric cooperatives (co-ops) to develop on-bill finance programs, with a large portion being dedicated to the Southeast.

Addressing Energy Waste in the Southeast

In addition to the negative environmental consequences, which are significant, the inefficient use of energy has profound social and economic impacts that affect every community throughout the United States. However, because energy waste presents such a significant problem, fixing that problem offers a substantial economic opportunity. For example, a 2012 report by Deutsche Bank and the Rockefeller Foundation found that meeting the need for cost-effective energy efficiency improvements nationwide amounted to a potential investment of \$182 billion in the residential sector alone.²

The Southeast holds roughly one-third of all the untapped energy efficiency potential in the entire country,³ with potential energy savings exceeding 30 percent of total residential demand in states such as North Carolina and Kentucky.⁴ In other words, there is a substantial amount of energy being wasted in the region every year, and that imposes a greater economic burden on households and local economies in southeastern states, especially for low-income and rural communities.

For instance, a 2016 study by the American Council for an Energy Efficient Economy found that residents in this region — particularly low-income and minority residents — spend a greater percentage of their household income on home energy costs than residents elsewhere.⁵ And a 2013 study by Appalachian Voices showed that populations served by rural electric co-ops face a higher energy burden and experience higher levels of poverty than those served by larger investor-owned utilities.⁶

Inclusive “Pay As You Save” Financing as a Key Solution

Despite these findings, few utilities offer energy efficiency programs that benefit low-income residents in the Southeast. This is especially true for electric co-ops. Furthermore, federal programs such as the Low-Income Home Energy Assistance Program (LIHEAP)⁷ and the Weatherization Assistance Program (WAP)⁸ fall short of meeting the existing need. In the case of LIHEAP, the majority of the funding is used to pay residents’ energy bills, but fails to address the underlying causes of high energy bills for low-income households, such as aging and inefficient heating systems and poor insulation.

Solving this problem in our region, while not necessarily easy, is certainly achievable. In addition to increasing federal funding for grants that provide direct assistance to low-income households, the solution lies in financing — particularly financing that is available to all residents regardless of their income, home-ownership status or credit scores. Such “inclusive” financing is taking hold across the United States, and the front-runners are leading electric co-ops serving Appalachia and the Southeast.

The most prominent model of inclusive financing is known as Pay As You Save® (PAYS®).⁹ As noted with on-bill financing, the utility finances the full upfront cost of energy efficiency improvements and recovers the cost of the improvements on a customer’s electric bill. Many other on-bill programs are structured like a traditional loan, so most of the customers who need financing the most — including renters and those with poor credit scores — are not eligible for the programs. However, the PAYS® on-bill finance model opens up access to financing to virtually everyone in two important ways:

1. instead of credit scores, a customer’s utility bill payment history is used to determine eligibility, meaning that as long as a customer has not missed too many payments on their electric bill they will be eligible for the program; and,
2. the cost-recovery charge on a customer’s bill is tied to the property and not the person, meaning it applies to both current and future customers at a specific utility meter— thereby opening the program up to renters — and a customer has no remaining obligation after moving out.

In addition, the PAYS® model caps annual repayments to the utility at 80 percent of the estimated savings from the improvements. This means that even with the new monthly charge on a customer’s bill, annual energy bills are lower than they were prior to the efficiency improvements. To date, 12 co-ops in the Southeast — five in eastern Kentucky, five in South Carolina, one in Arkansas and one in North Carolina — have implemented the PAYS® system or similar on-bill energy efficiency finance models with great success, and a handful of new programs are currently in development.

One of the most impactful and equitable ways of addressing energy waste in our region is for all electric utilities to adopt these financing models. Doing so will not only alleviate the energy burden faced by hundreds of thousands of families and improve their health and quality of life, it will also strengthen and expand rural economies by annually injecting tens of millions of dollars in new investment into local communities. Co-ops have a responsibility to do their part to ensure that their members benefit from this opportunity.

The Opportunity and Responsibility for French Broad Electric Membership Corp.

In the region served by the French Broad Electric Membership Corporation (EMC), energy waste is having severe economic and financial impacts on families and local economies, and an inclusive energy efficiency finance program would yield substantial benefits. There is a clear and immediate need for such a program, as well as strong support from co-op members and community representatives.

As with all co-ops, French Broad EMC is owned by the members it serves and is bound by the Seven Cooperative Principles.¹¹ The seventh principle, “Concern for Community,” states: “Cooperatives work for the sustainable development of their communities through policies supported by the membership.”

Inclusive energy efficiency financing fits squarely with this principle by: (i) strengthening local economies while keeping the large majority of the generated wealth local; (ii) improving local housing conditions and area livability; (iii) enhancing the quality of life for residents; (iv) lowering energy bills and alleviating the burden of energy costs for French Broad members; and, (v) generating substantial environmental benefits.

A key responsibility of any electric co-op should be to help reduce energy use and costs for all of its members. Selling electricity is merely a business model; providing needed member services is the cooperative model. Most co-op members who need help with improving the energy efficiency of their homes and lowering their energy bills cannot afford to pay for those improvements on their own and are unable to access traditional financing or other support. Their electric co-op has a principled responsibility to help them.

Inclusive on-bill energy efficiency financing based on the PAYS® model serves as the best model for achieving this goal. Any electric co-op wishing to implement their own PAYS® program has numerous resources available to them, including the experience of other co-ops that have implemented the PAYS® model, free consulting services, program operator support and low-cost federal capital through the USDA’s EECLP or Rural Energy Savings Program, either of which can provide the co-op with capital to invest.

Energy efficiency programs do not just benefit the members who participate by providing vital services for residents and improving member satisfaction with the co-op. They also benefit the co-op by reducing demand and operating costs and saving the co-op — and therefore its members — substantial money over time.

Given the scale of need that exists, the benefits generated for the co-op and its members, and the resources and experience available to electric co-ops, there is no reason for any co-op not to develop an inclusive energy efficiency finance program.

This report details the level of need for energy efficiency investments in the French Broad EMC service area and provides a measure of the benefits that could be generated by a modest PAYS® program implemented by the co-op.

The Need for Energy Efficiency Investments in the French Broad EMC Service Area

Virtually all rural communities throughout the United States may be characterized by old and energy-inefficient housing, outdated heating and cooling systems, lower-than-average incomes and high poverty levels. These factors result in unnecessary energy waste and unnecessarily high energy costs for low- to moderate-income residents, straining already limited household budgets. The region served by French Broad EMC serves as a prime example of this situation.

This section analyzes relevant housing, socio-economic and energy cost data for the three main counties served by French Broad EMC, in order to assess the degree to which households served by the co-op are in need of financing support for home energy efficiency improvements. The counties analyzed are Madison, Yancey and Mitchell counties, which together account for approximately 81 percent of all French Broad members.¹¹ For simplicity, Buncombe County in North Carolina (16 percent) and Unicoi (2.6 percent) and Cocke (less than one percent) counties in Tennessee were excluded, so the number of homes in need is greater than what is presented here. However, county-specific estimates for the economic benefits that would be generated by a French Broad EMC on-bill finance program are provided for all six counties in the Appendix.

Housing Characteristics

According to the US Census Bureau's American FactFinder database, there were an average of 22,210 occupied housing units in the three-county region from 2011-2015. Of these, 16,656 (75 percent) were owner-occupied properties, and 5,554 (25 percent) were rental properties. The largest majority of properties (71 percent) were single-family homes, followed by manufactured housing (23 percent) and multi-family housing (6 percent). Overall, there were 13,091 owner-occupied, single-family homes, accounting for 59 percent of all occupied housing.¹²

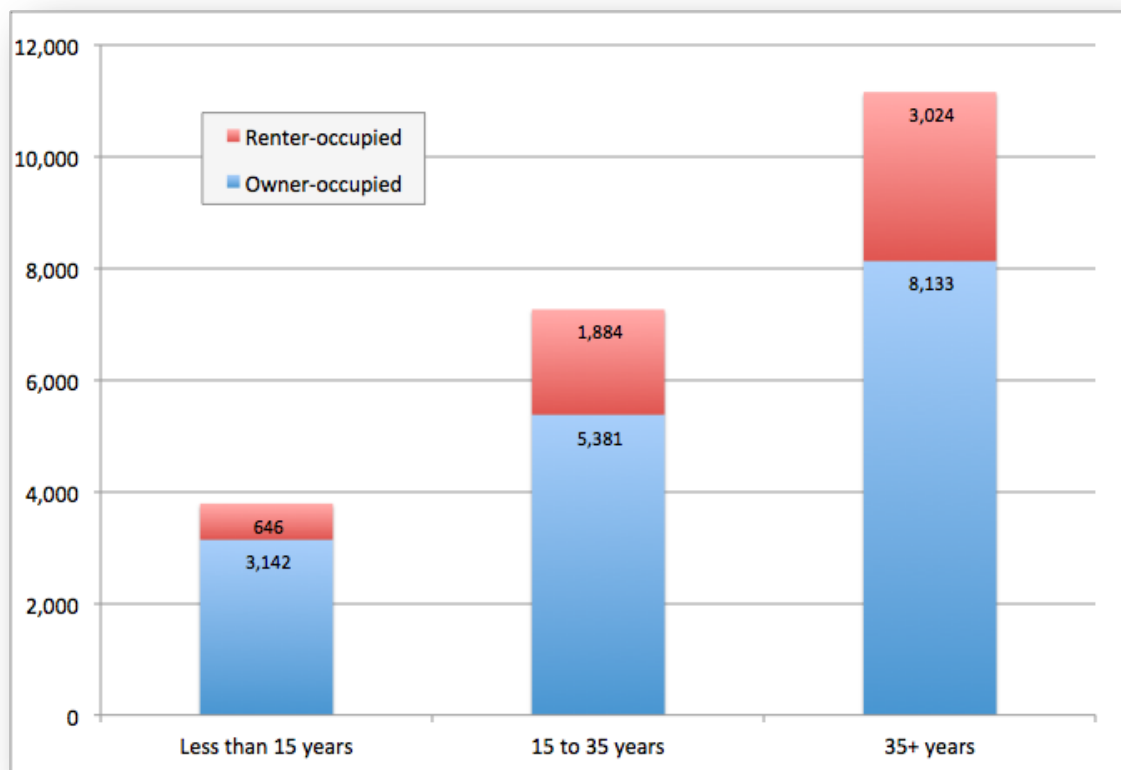
Table 1: Occupied housing in the French Broad EMC region, by ownership and type of housing

| Type/Tenure | Owner | Renter | Total | Percent total |
|----------------------|---------------|--------------|---------------|---------------|
| Single-family | 13,091 | 2,760 | 15,851 | 71.4% |
| Multi-family | 60 | 1,210 | 1270 | 5.7% |
| Manufactured | 3,505 | 1,584 | 5,089 | 22.9% |
| Total | 16,656 | 5,554 | 22,210 | 100.0% |
| Percent total | 75% | 25% | 100% | |

Of most relevance for this report is the fact that half of all housing was more than 35 years old as of 2015, including 60 percent of all single-family housing. Of the 22,210 occupied housing units, 11,157 (50.2 percent) exceed 35 years in age, including 49 percent of owner-occupied units and 54 percent of renter-occupied units. Also notable is that 5,075 housing units, or nearly a quarter of all occupied housing, exceed 55 years in age.

Given that older homes are more likely to lack sufficient insulation, require air sealing to eliminate leaks and have aging and inefficient appliances and heating systems, there is a significant potential need for energy efficiency improvements in most of the region's housing. In most cases, it can be assumed that all homes more than 35 years old have a high level of need for energy efficiency improvements and investments, which for the French Broad region amounts to 11,157 housing units. Even homes ranging from 15 to 35 years old are likely to require some energy efficiency improvements.

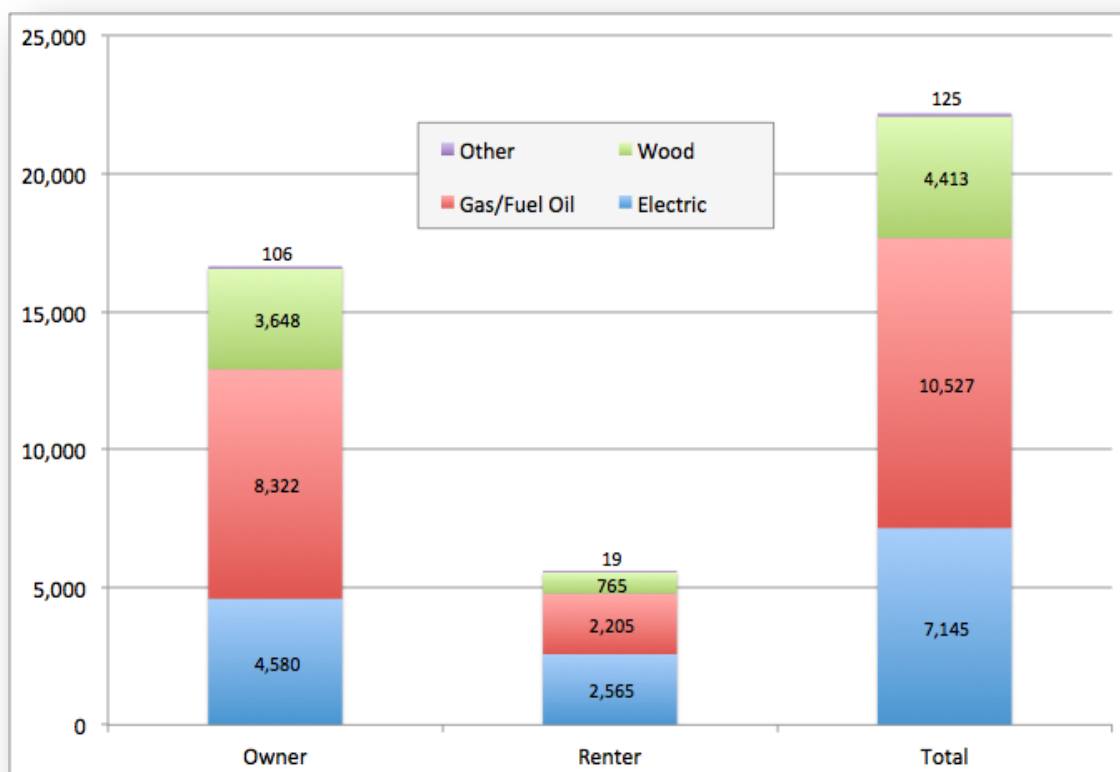
Figure 1: Number of housing units by ownership type and age range



Heating Fuels

The large majority of homes in the three-county region we analyzed use non-electric heating systems as their primary heating source. Of the 22,210 occupied housing units, only 7,145 (32 percent) of them use an electric heating source. Nearly half of all homes or apartments use systems fueled by natural gas, kerosene or fuel oil, and one-fifth heat primarily with wood. These values differ depending on whether the housing is owner- or renter-occupied. While only 28 percent of owner-occupied homes are heated with electricity, 46 percent of rental properties use electricity as the primary heating source, amounting to a total of 2,565 housing units.¹³

Figure 2: Primary heating source for occupied housing units, by ownership status



The relatively low percentage of all-electric homes, those using electricity for their primary heat, in the French Broad EMC service area may cause some concern for the co-op. This is because it is much simpler for an electric utility implementing a PAYS® on-bill finance program to estimate and monitor energy and cost savings for all-electric homes. For homes using non-electric heating, the co-op has two options in order to track and verify non-electric energy savings. They can collect and record all of a participant's gas, kerosene or other fuel bills and model those appropriately, or they can promote "beneficial electrification," converting the home/apartment to an energy efficient electric heating source and then compare all future savings to past energy bills.

Both approaches have been demonstrated effectively by other programs, and existing modeling software is already capable of facilitating such situations. This is an especially important consideration given that the large majority of French Broad EMC members use non-electric heating, and, as demonstrated in the next section, energy costs are significantly higher for homes heated with non-electric systems.

Energy Use and Costs

Assessing energy use and costs for French Broad EMC members is difficult without having access to actual household data. Therefore, in this section we use available reported averages to illustrate the energy cost profile for French Broad members. Additionally, we report on the burden of home energy costs for residents of the three main counties served by the co-op.

According to the federal Energy Information Administration (EIA), there were 37,468 total electric meters connected to French Broad's electric system in 2015, the latest year for which data are available.¹⁴ Of those, 34,301 (88 percent) represent residential properties, and more than 97 percent of those properties are located in North Carolina. Total electricity sales to residential properties amounted to 305,590 megawatt-hours, resulting in a simple average of just over 8,900 kilowatt-hours (kWh) per home in 2015. However, comparing county-level US Census county-level data for occupancy rates¹⁵ to the number of residential meters reported by French Broad EMC, we found that more than 8,000 (23 percent) of those properties are vacant, consuming little to no electricity, so the actual average electricity use at occupied homes is much higher.

To estimate the number of residential properties that are occupied and actively consuming and purchasing electricity from French Broad, we adjusted each county's estimate as necessary based on the respective county's occupancy rate as reported by the US Census Bureau. **Using this method, we estimate that there were approximately 25,300 residential properties (meters) served by French Broad EMC that were actually occupied in 2015. As such, the average annual electricity consumption per household was 12,100 kWh, and the average annual electricity bill was approximately \$1,575.**

Because electric heating systems serve as the primary heating source for only 32 percent of all occupied units in the main three-county area, the average electric bill does not reflect actual home energy costs for French Broad members since costs for non-electric heating fuels must also be considered for the large majority of members. Unfortunately, data for average non-electric heating costs are only available as regional or national averages. However, these averages do indicate how much more non-electric heating sources cost, and we can use them to estimate the total energy bills for homes heated with electric and non-electric heating sources.

EIA projected that average winter home heating costs last winter for US homes were \$1,227 for homes using heating oil (which accounts for another 32 percent of French Broad EMC households), compared to \$902 for electricity, representing a cost increase of 36 percent.¹⁶ Given that the national average for the percentage of homes heated with electric systems (37 percent) and non-electric systems (63 percent) is similar to the 32/68 split for homes served by French Broad EMC;¹³ that the average 2009 average heating expenditures by fuel source for homes in North Carolina and other Southern states are similar to the national projected averages for last winter;¹⁷ and, that property-specific information for homes served by French Broad EMC is unavailable, we determine that the EIA projections represent the best estimate of average home heating costs for French Broad EMC households.

Therefore, using the EIA heating cost values, and guided by the assertion made by French Broad EMC that approximately 49 percent of a home's energy cost in their service area is for space heating,¹⁸ we estimate that the average annual energy bill for an all-electric home served by French Broad EMC was approximately \$1,844 in 2015. This cost represents the sum of \$902 for heating, and \$943 for non-heating electricity consumption.

Using the same calculation, we estimate that the average home using a non-electric heating source spends \$2,677 in total energy costs, representing the sum of \$1,277 for non-electric heating costs (approx. 48 percent of total energy costs), and \$1,450 for other electricity costs.

It is notable that the non-heating electricity costs for homes using the two heating types are substantially different: \$943 for all-electric homes, and \$1,450 for homes heated with non-electric fuels. While no specific reason can be determined for this discrepancy, a review of the data for housing and heating system characteristics does provide one good explanation.

For instance, 59 percent of all occupied properties in the three-county area we analyzed are owner-occupied single-family homes, and overall, 73 percent of these homes use non-electric heating sources. Additionally, one-third (more than 2,500) of the all-electric homes are rental properties, and there are an additional 3,500 manufactured homes, the large majority of which are likely to be heated using electric resistance baseboard heaters. In other words, on average, it can be asserted that the homes heated with non-electric heating sources are larger, and can be expected to consume more electricity for purposes other than heating than the majority of all-electric homes. This could feasibly explain the discrepancy in non-heating electricity costs for homes of different heating types, and likely does given the following confirmation of our results.

Using the total electricity cost values for homes heated with electric and non-electric heating systems to calculate a weighted-average *electricity* bill for French Broad members results in a total average bill of \$1,575, which is the same as the previously reported average, thus confirming our results. Therefore, taking non-electric heating costs into account results in an overall average annual energy cost for French Broad EMC members of \$2,409.

Table 2: Electricity and total energy costs for French Broad members in 2015

| Heating type | Number of homes | kWh per home | Electric bill | Non-electric heating bill | Total energy cost |
|----------------------|-----------------|---------------|----------------|---------------------------|-------------------|
| Electric | 8,100 | 14,740 | \$1,840 | \$0 | \$1,840 |
| Non-electric | 17,200 | 11,160 | \$1,450 | \$1,227 | \$2,677 |
| Total/average | 25,300 | 12,100 | \$1,575 | | \$2,409 |

Poverty, Income and the Burden of Home Energy Costs

High energy costs for a given area — such as the region served by French Broad EMC — are exacerbated by high rates of poverty and lower-than-average household incomes. According to the US Census, of the 22,210 occupied housing units in the three-county area, 4,263 (19.2 percent) earned a gross household income that fell below the federal poverty line from 2011-2015. Mitchell County experienced the highest rate of household poverty at 23.5 percent, followed by Yancey County at 20.5 percent and Madison County at 14.8 percent. By comparison, the statewide average household poverty rate for North Carolina was 15.9 percent.¹⁹

Each of the three counties also has a substantially lower median household income than the state average. While median incomes were in the \$37,000-\$38,000 range for each county, the state median income is 20 percent higher at nearly \$47,000.²⁰

Table 3: Poverty and income levels in the French Broad EMC service area

| County | Number of households | In poverty | Percent household poverty | Median income |
|-----------------------|----------------------|----------------|---------------------------|-----------------|
| Madison | 8,450 | 1,252 | 14.8% | \$37,904 |
| Mitchell | 6,344 | 1,490 | 23.5% | \$37,391 |
| Yancey | 7,416 | 1,521 | 20.5% | \$37,484 |
| Total | 22,210 | 4,263 | 19.2% | |
| North Carolina | 3,775,581 | 602,058 | 15.9% | \$46,868 |

A measure that has gained greater attention in recent years is “home energy cost burden,” which is defined as the percent of gross household income that is spent on energy costs. Prior research has determined that the maximum a low- or moderate-income household can afford to spend on home energy costs is 6 percent of household income. The average household in the three-county region spent 6.4 percent of their income on energy costs in 2015.²¹ By this measure, energy costs for the average household served by French Broad EMC are above the 6 percent threshold for affordability.²² For all-electric homes, the average was 4.9 percent, while for homes with non-electric heating systems the average was 7.1 percent.

For low-income households, the energy cost burden far exceeds the area average. As noted, 20 percent of total households, numbering about 4,300 total households in the three-county area, have a gross household income below the federal poverty line. However, there are 6,828 homes that are LIHEAP-eligible in the three-county French Broad area. These households have incomes up to 150 percent of the federal level and represent more than 30 percent of all occupied households.²¹

As shown in the following table, the more impoverished a home is, the greater the burden of energy costs. For the poorest households, energy costs averaged 36.5 percent of household income in 2016 — or six times what is considered affordable. The homes that are above the poverty level but are still eligible for LIHEAP funding spent 10 to 13 percent of their income on energy bills in 2016.

Table 4: Energy cost burden for French Broad area low-income households, 2016

| Percent of poverty level | Number of households | Average energy burden |
|---------------------------------|----------------------|-----------------------|
| < 50% | 1,649 | 36.5% |
| 50-99% | 2,722 | 19.5% |
| 100-124% | 1,287 | 13.0% |
| 125-149% | 1,170 | 10.6% |
| | | |
| Area average (2011-2015) | | 6.4% |
| Deemed affordable | | 6.0% |

Estimate of Households in Need and Why Existing Resources Fall Short

Nearly every home could benefit from some level of energy efficiency improvements, whether it’s as simple as replacing incandescent light bulbs with energy efficient LEDs, or as comprehensive as replacing an inefficient heating system with a newer efficient system, sealing all air leakages and insulating the attic and crawlspace. The actual level of need and the potential for cost effective investment can only be determined by conducting a home energy audit that includes assessment of past energy bills. However, housing and socio-economic indicators provide information that can be used to develop an initial assessment of the number of homes that are in need of energy efficiency improvements, as well as the number of households that are unable to afford to pay for those improvements.

For instance, the high prevalence of owner-occupied single-family housing within the French Broad EMC service area suggests an opportunity for conducting easier transactions for energy efficiency financing. Additionally, the large number of rental properties and aging housing units suggests that there is the potential for achieving substantial energy and cost savings from financed retrofits for French Broad members. Finally, the high energy cost for the area combined with the number of impoverished and energy cost-burdened households indicates that there are a large number of households that likely are in need of energy improvements but cannot afford to make those investments on their own.

Using the number of households living below the poverty line in the three-county area we have analyzed as the minimum, and the number of homes that are more than 35 years old as an upper limit, we estimate that between 4,300 and 11,150 households are in need of significant investments in home energy efficiency, representing 20 percent to 50 percent of all occupied households in the study area.

Unfortunately, despite the existence of federal programs that provide weatherization and bill payment assistance to low-income households, the large majority of those in need are unable to benefit. Additionally, the majority of existing funding, provided via LIHEAP, goes toward paying people's utility bills, and does not address the underlying problems with home efficiency that lead to high energy bills in the first place.

For instance, in Madison County alone, more than 2,500 households are eligible for federal assistance through the WAP and LIHEAP programs, and more than 1,500 homes fall below the federal poverty level. These households spend between 20 and 37 percent of their household income on energy costs.²¹ However, according to data provided to Appalachian Voices by Community Action Opportunities, the community agency responsible for administering WAP funds in Madison County, only five homes received weatherization assistance grants in 2015 and in 2016.²³ At that rate, it will take 30 to 50 years to weatherize all of the homes in greatest need of such assistance.

Additionally, only one in every five households that are eligible to receive support for paying their energy bills actually receive help through the LIHEAP program.²⁴ This percentage holds true locally in Yancey County, where the Southern Reconciliation House reports that they are able to help pay monthly energy bills for only one in every five to ten homes that need it.²⁵

Overall, thousands of households served by French Broad EMC are in need of a program that offers energy efficiency financing that is available to residents of all income levels, regardless of whether they own or rent the property where they live. And while French Broad offers a limited financing program for mini-split heat pumps, many of the most cost-effective and impactful energy improvements are in insulation, air sealing, lighting, appliance upgrades and programmable thermostats — none of which the co-op currently finances.

Developing a comprehensive on-bill finance program based on the PAYS® inclusive financing model can meet the need that exists among French Broad EMC members, thereby alleviating the burden of energy costs experienced by thousands of residents.

Benefits for French Broad EMC, Its Members and Local Economies

If French Broad EMC were to develop and implement a modestly scaled and appropriately supported PAYS® on-bill energy efficiency finance program, thousands of co-op members would benefit through lower home energy bills and enhanced home comfort, especially in the winter months when energy bills are highest. The co-op would benefit as well because every home that participates is likely to see the greatest savings in the winter, when their energy demand is the highest.

By lowering that demand through energy efficiency investments, the co-op saves money. And these savings are passed on to all members through capital credit payments or by keeping rates lower. The local economy also benefits from the millions of dollars in new investment, which would create new jobs in the contracting and retail sectors. Additional benefits would result from members spending their energy savings locally on other needed household items.

Overall, on-bill financing benefits everybody. This section reports our estimates of the impacts that a modestly scaled PAYS® on-bill finance program would have on participating households, French Broad EMC and local economies over the first ten years of operation.

Benefits for Participating Members

Each of the existing on-bill finance programs operating in South Carolina, eastern Kentucky, North Carolina and Arkansas began at their own pace. On the low end, the How\$mart Kentucky program began as a pilot, retrofitting approximately 100 homes per year in the first two years.²⁶ South Carolina's Help My House program retrofitted 125 homes in the first year.²⁷ Roanoke Electric's Upgrade to \$ave program achieved 175 retrofits in the first year and aims to average at least 200 homes per year through 2017.²⁸ Ouachita Electric's HELP PAYS® program in Arkansas appears on track to exceed that value.

Using these examples and a steady ramp-up from year to year, we model annual home energy retrofit projects that could reasonably be completed through a French Broad EMC on-bill finance program, starting with 100 projects in the first year and growing to 600 projects in year ten, resulting in 3,300 total home retrofit projects completed for members over the ten-year period.

To put that number into perspective, 3,300 homes amounts to approximately ten percent of all residential meters served by the co-op, and 13 percent of all meters serving occupied households. It represents 30 percent of all households that are more than 35 years old, 48 percent of all LIHEAP-eligible homes, and 75 percent of all households living in poverty in the three-county French Broad region we analyzed.

To model the benefits for individual participants, we assume that the homes that participate will be those that experience higher-than-average energy bills. Starting with our earlier finding that the average occupied property served by the co-op uses 12,300 kWh per year, we assume that the most likely participants would experience annual energy use that is 50 percent higher, resulting in an average of 18,150 kWh a year.

Our model looks only at the benefits for homes that use electric heating systems for their primary heating source. However, as described earlier in the report, all-electric homes spend less on total annual energy costs than homes heated with non-electric systems. In other words, the benefits for homes that use gas or heating oil to heat their home would likely experience greater energy cost savings than is estimated in this report.

We further assume that the average energy and cost savings for participants would reflect the minimum average savings achieved by other existing on-bill finance programs. While the Roanoke Electric and South Carolina programs have reported estimated average energy savings of around a 30 percent,^{27,28} the How\$mart Kentucky program has achieved a 25 percent average savings,²⁶ and serves an area with a similar climate and demographic as French Broad EMC. Therefore, we assume that the average French Broad member participating in an on-bill finance program would experience a 25 percent savings.

Finally, we assume that the residential electricity rate of 11 cents-per-kWh currently charged by French Broad would not change over time. Rates typically go up, not down, which would result in even greater cost savings for residents than what is estimated in this report. However, no information is currently publicly available that would provide any indication of how rates may change in the future.

Based on these factors, we estimate that the average participant in a French Broad EMC on-bill finance program would save more than 4,500 kWh per year and experience a gross reduction in their annual energy bills of \$500, or around \$42 each month. However, under the PAYS® financing model, 80 percent of those savings (\$34) would be used to pay the co-op's cost recovery charge for financing the energy efficiency improvements, with the household keeping the remaining \$8 each month, on average, amounting to a total of approximately \$100 a year.

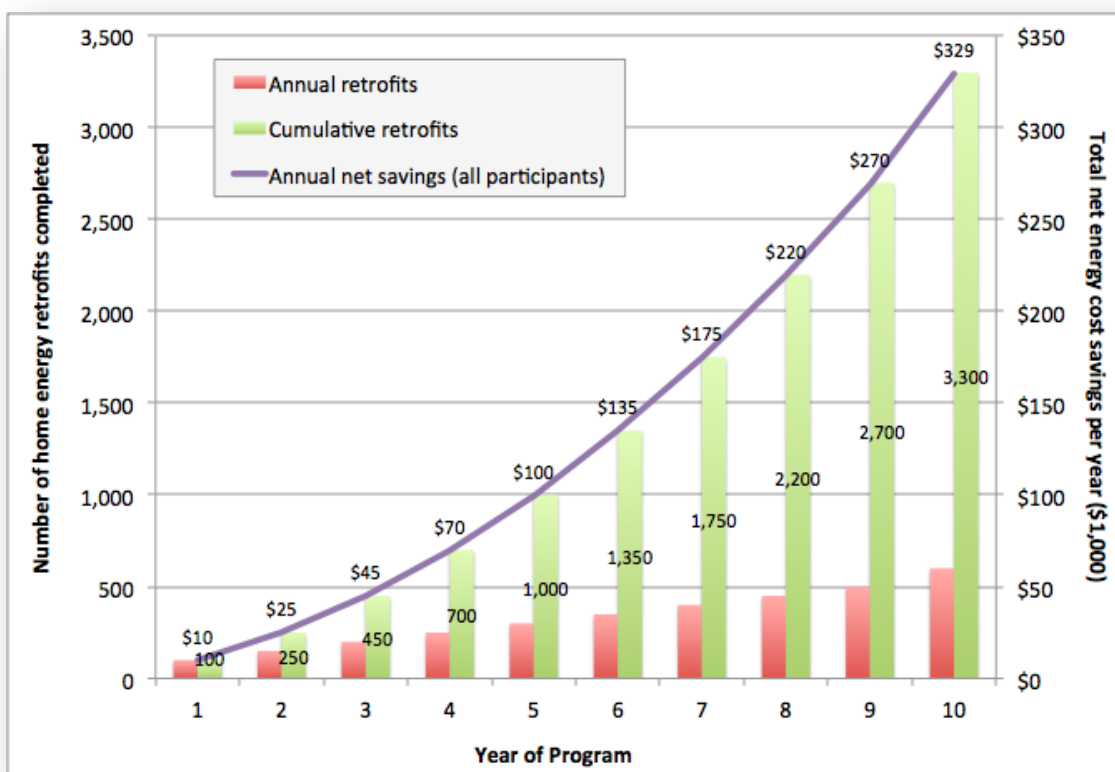
While this seems like a modest savings, it is important to note that this represents an average over 12 months. Savings in the summer months, when heating systems aren't being used, would be lower, while savings in the winter when energy use and costs are the highest would be much higher. Then, after the participant has paid the co-op back for the investment, they would keep the full \$500 savings each year. **Assuming a ten-year payback period, participants would net about \$1,000 in total savings over ten years, and an additional \$5,000 in the ten-year period after that.**

Higher energy users, meaning those that exceed the 18,150 kWh per home used as the initial energy use in our model, would experience even greater savings, as would those who use non-electric heating sources, which accounts for the large majority of French Broad EMC members.

If the co-op increases their rates, the value of the savings for participating households increases as well. Additionally, the home would be much more comfortable throughout the year, and health problems resulting from poor indoor air quality would be reduced or eliminated.

As more homes are retrofitted from year to year, the energy and net cost savings generated by the program would grow from approximately 450,000 kWh and \$10,000 saved (net) for 100 homes in year 1, to 15 million kWh and \$330,000 in total net savings for 3,300 homes in year ten, for an annual average of approximately \$138,000. **Cumulatively, the program would generate an estimated savings of 62.6 million kWh and put nearly \$1.4 million back into the pockets of participating French Broad EMC members, in just the first ten years of operation.**

Figure 3: Annual and cumulative home energy projects completed, and total net cost savings



Benefits for French Broad EMC

As with nearly all utility energy efficiency programs, on-bill finance programs generate substantial savings not only for participants, but also for the utility, in this case French Broad EMC. However, first and foremost, such programs provide a service to co-op members. As described in the introduction, all co-ops adhere to the Seven Cooperative Principles. Principle Seven — “Concern for Community” — states that “Cooperatives work for the sustainable development of their communities through policies accepted by their members.”¹⁰ On-bill financing is a clear and high-impact way of working toward the sustainable development of the communities served by French Broad EMC.

With energy costs, a concern for community would be directly expressed by doing everything in the co-op’s power to lower energy costs, especially for those members who struggle the most with paying their energy bills. Additionally, member satisfaction is something that all co-ops seek to maximize. According to a survey conducted by South Carolina’s Help My House program, 95 percent of participants reported that they were more satisfied with their co-op after receiving financing for home energy improvements. According to Mike Couick, CEO of the Electric Cooperatives of South Carolina, “I don’t believe it’s a sustainable business plan to try to sell electricity that a member can’t afford. The bottom line is their satisfaction and well-being.”²⁷ This is a value that should serve as the foundation of all decisions made by electric co-ops.

Another less-quantifiable benefit is the reduction in administrative time and costs associated with lowering members' energy bills. Co-ops spend time dealing with high bill complaints or helping people establish a plan for paying their energy bills when they struggle to do so. But a co-op offering on-bill financing to its members, with a strong focus on achieving participation by members who struggle with paying their energy bills, will lower its administrative costs and save the co-op and its members money.

Aside from the benefits generated for participating members, the most significant financial benefit for the co-op is the reduction in costs that results from reducing energy demand. In addition to wholesale power costs, French Broad EMC pays Duke Energy \$20 for every kilowatt of demand.¹⁸ Demand is defined broadly as the aggregate amount of generating capacity required to serve French Broad members during any 15-minute period each month. For instance, if French Broad EMC's demand peak in October is 300 megawatts, French Broad EMC pays Duke \$6 million for demand costs for that one month.

According to South Carolina's Help My House program, the average reduction in annual demand for each home that receives an on-bill finance investment is approximately one kilowatt (kW) per home per month.²⁷ However, given that French Broad EMC serves a winter-peaking area, for the purposes of this report we chose to use a more conservative estimate of 4 kW saved per home per year, representing one kW for each of the four main winter heating months (November through February).

Based on this level of savings, and not accounting for any administrative cost savings that may result, the financial savings for French Broad EMC and its members from implementing a modest on-bill finance program would amount to an estimated average of \$110,400 a year, or \$1.1 million over ten years. Those savings will continue to accrue each year, even if French Broad were to discontinue the program after ten years.

It is important to recognize that these savings will be more than offset by the reduced revenue that will result from lowering people's energy use. In fact, assuming that rates stay the same and demand doesn't change over the ten-year period, our model estimates that French Broad will experience an average annual revenue loss of 0.9 percent, with revenues in year ten being 2.2 percent lower than current (2015) levels. Total revenue loss in year ten would amount to approximately \$900,000, while total demand savings would amount to approximately \$264,000, for a net loss to the co-op of \$636,000, representing a loss of 1.5 percent.

While this is a natural result from lowering energy use for members, it is not a value for which much credibility can be given. First, electric co-ops such as French Broad EMC are first and foremost committed to serving their members, which includes lowering energy costs for those members who struggle to pay their bills, and lowering energy costs means reducing the amount of energy sold.

However, from a financial standpoint, energy demand does not stay flat, nor do electricity rates, so estimates for revenue loss are highly vulnerable to even slight changes to either of these variables. For instance, a 0.9 percent increase in annual electricity demand would eliminate any revenue loss that may occur from an on-bill finance program, as would lower administrative costs or any future increase in the price of demand charges by Duke Energy.

Finally, the fact that more than two out of every three homes served by French Broad are heated with non-electric fuel sources, most with systems that are likely old and inefficient, suggests that there is an opportunity for the co-op to replace those inefficient, non-electric systems with new high-efficiency electric heating systems. **This is known as "beneficial electrification," and can lower total energy costs for those members while also increasing electricity sales for the co-op, thereby helping to offset any net overall revenue loss that may result.**

Local Economic Impacts

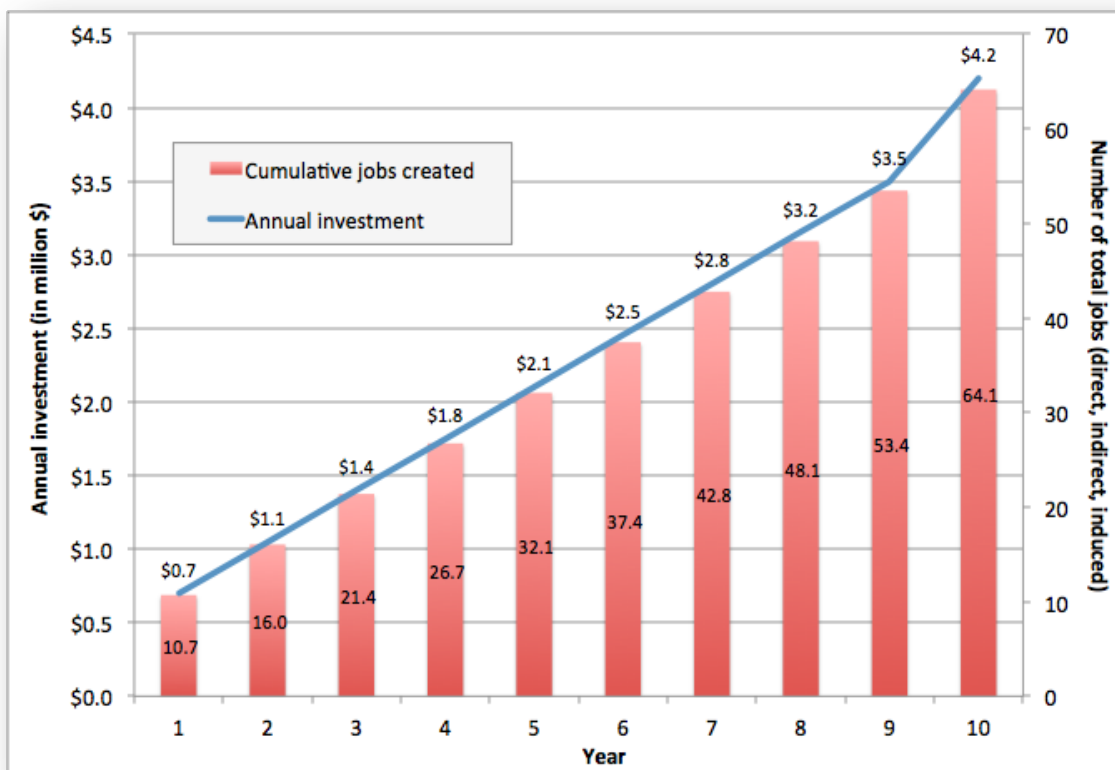
Any program or initiative that injects new capital into local economies strengthens those economies by growing local businesses, directly creating new jobs and supporting other jobs indirectly. For instance, with on-bill financing, the co-op pays energy efficiency and appliance contractors to provide the home energy improvements, thus supporting and growing those businesses, creating and sustaining jobs in the process. The contractor then purchases the insulation, caulk and other materials used to make homes more energy efficient from local hardware stores, thereby indirectly supporting and growing those businesses. Finally, as residents save money on their energy bills, they are likely to spend a portion of those savings at local grocery stores and retail stores. This results in what are known as induced economic benefits, since that spending further supports local jobs and businesses.

For this report, we estimate only the total jobs that could be created per \$1 million of energy efficiency investments made in the French Broad EMC service area. To do so, we use the Southeast Energy Efficiency Alliance (SEEA) calculations for prior investments made through residential energy efficiency programs in North Carolina. In their analysis, SEEA found that every \$1 million generated a total of 15.3 new direct, indirect and induced jobs for North Carolina communities.²⁹

Based on our model where a French Broad EMC on-bill finance program would retrofit 100 homes in year one and grow to 600 homes by year ten, and using an average per-home investment of \$7,000, we estimate that the program would generate \$700,000 in new investment in year one and grow to \$4.2 million in year ten. We then estimate that approximately 10.7 full-time equivalent jobs would be created in year one, increasing to 64.1 total jobs created or sustained in year ten (note: the number of *new* jobs created in year ten is 10.7, bringing total jobs created by the program to 64.1). Direct jobs amount to approximately half of the total each year.

The following chart shows the growth in annual investment and job creation as the program grows over the ten-year period. County-specific investment and job results are provided in the Appendix.

Figure 4: Annual investment and cumulative job creation for French Broad communities



Support from the French Broad EMC Communities

Since Appalachian Voices began reaching out to members and community stakeholders in the French Broad EMC service area two years ago, we have seen strong and growing support from community members for an inclusive on-bill energy efficiency finance program. That support includes residents, local businesses, agencies serving low-income populations, county government agencies, regional economic development agencies and county commissions.

To date, we have collected the following expressions of support:

- More than 100 signatures of support by French Broad EMC members
- More than 20 letters of support from local businesses, service agencies and other community stakeholders
- An attendance of approximately 60 residents and stakeholders at our French Broad Community Energy Forum in November 2016
- Resolutions passed by the Yancey and Mitchell County Commissions supporting the development of a voluntary on-bill energy efficiency finance program by French broad EMC

Appalachian Voices remains committed to continuing our outreach to community members and stakeholders, discussing with them the on-bill financing opportunity and continuing to grow support.

Conclusions and Recommendations

This report details the level of need for energy efficiency investments in the French Broad EMC service area and provides a measure of the benefits that could be generated by a modest PAYS® on-bill energy efficiency program implemented by the co-op. The intent of the report is to highlight the important role that French Broad EMC can and should play in helping its members lower their energy costs while also contributing to the sustainable development of the communities it serves.

Based on our understanding of the various energy efficiency program models being offered by other electric utilities, it is clear that an inclusive on-bill energy efficiency finance program based on the Pay As You Save model is the best and most effective option for achieving these goals. The scale of the problem of energy waste in the co-op's service area is too substantial, and the resulting economic burden on the area's households too great, for the co-op not to take advantage of the opportunities and services available for developing such a program.

Our analysis of existing housing, socio-economic and energy use data for the French Broad co-op service area concludes that there is a substantial unmet need among residents for home energy efficiency improvements. Given the high poverty rate and the burden of home energy costs for low-income households, the large majority of those residents likely cannot afford to pay for those improvements themselves. Additionally, existing federal programs that offer bill payment assistance or weatherization grants are grossly insufficient for meeting that need.

Further, despite public statements by French Broad EMC suggesting that its members enjoy lower-than-average home energy costs, the opposite is true. On average, area households spent an estimated \$2,400 per home in 2015, representing an average of more than 6 percent of household income, which exceeds the level that has been determined to be affordable for the average household,²² and is also more than double the national average.³⁰ For the nearly 4,400 homes that fall below the federal poverty line, that burden is much higher, ranging from 20 to 37 percent of household income.

Addressing this need through inclusive on-bill financing will lower energy costs for French Broad EMC members, making their homes more comfortable and healthier places to live in the process. By reducing energy use during times of peak demand in the winter months, this program will also lower demand costs for the co-op, thereby benefitting all co-op members by helping the co-op keep rates low. Finally, by injecting millions of dollars a year in new investments in the communities it serves throughout the co-op service area, French Broad EMC would help strengthen local economies and create new jobs. In other words, there is no downside to on-bill financing.

The PAYS® model of inclusive on-bill financing has proven to be successful, cost-effective and appreciated by the residents and even businesses that have participated. Additionally, the model itself is flexible enough to be tailored to a co-op's specific needs and service area. Because of the substantial benefits it has generated wherever it is offered, a total of 12 PAYS® on-bill financing — or very similar models — now exist throughout the Southeast, with five programs operating in South Carolina, five in East Kentucky, one in Arkansas and one in North Carolina, with other programs currently in development.

Because of this growth, co-ops interested in offering a PAYS® program to their members have a wealth of experience and resources to draw upon. These include:

1. the willingness of those other co-ops to share and discuss their experiences and provide advice and consultation;
2. a low-cost financial modeling service through Meister Consulting Group that helps co-ops assess the costs and benefits of an on-bill finance program for both the co-op and its members;
3. low-cost federal capital through the US Department of Agriculture's Energy Efficiency and Conservation Loan Program or Rural Energy Savings Program;
4. free consulting support for developing a program model and business plan to be submitted to the USDA for funding;
5. affordable options for contracting with a third-party program operator to help develop and implement the program; and,
6. for French Broad EMC specifically, a strong network of local businesses, service agencies and other non-profit organizations committed to assisting in outreach and education and connecting residents-in-need to the program.

Given the level of need that exists among French Broad co-op members, the potential benefits to members, the co-op and local communities, and the wealth of resources and experience available to French Broad EMC for developing a program, Appalachian Voices recommends that French Broad EMC begin taking steps toward developing an inclusive on-bill energy efficiency finance program for its members, with a goal of having the program in place by Winter 2017.

Appendix: County-Level Economic Impacts of a Ten-Year French Broad EMC On-Bill Finance Program

| | Madison | Yancey | Mitchell | Buncombe | Unicoi | All counties |
|--|-----------|-----------|-----------|-----------|----------|--------------|
| Percentage of French Broad members | 34% | 33% | 14% | 16% | 3% | 100% |
| Number of homes retrofitted | 1,135 | 1,096 | 448 | 534 | 87 | 3,300 |
| | | | | | | |
| Energy savings | | | | | | |
| Avg. annual MWh saved | 2,154 | 2,078 | 852 | 1,014 | 163 | 6,262 |
| 10-year total MWh savings | 21,540 | 20,789 | 8,516 | 10,144 | 1,628 | 62,618 |
| | | | | | | |
| Net energy cost savings (all partic.) | | | | | | |
| Avg. annual savings (\$) | \$47,389 | \$45,736 | \$18,735 | \$22,317 | \$3,582 | \$137,759 |
| 10-year savings (\$) | \$473,889 | \$457,358 | \$187,352 | \$223,169 | \$35,817 | \$1,377,585 |
| | | | | | | |
| Investment and job creation | | | | | | |
| Avg. annual investment (\$ millions) | \$0.79 | \$0.77 | \$0.31 | \$0.37 | \$0.06 | \$2.3 |
| 10-year total investment (\$ millions) | \$7.95 | \$7.67 | \$3.14 | \$3.74 | \$0.61 | \$23.1 |
| | | | | | | |
| Direct jobs created (10-year total) | 8 | 8 | 3 | 4 | 1 | 23 |
| Total jobs created (10-year total) | 22 | 21 | 9 | 10 | 2 | 64 |

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