Case Study

Roanoke Upgrade To $ave Program

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Acknowledgments

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Executive Summary

The Upgrade to $ave Program provides Roanoke Electric Cooperative (REC) and its customers with a simple yet powerful energy-efficiency-financing product. To date, the program has performed much better than expected. Average realized savings have been on the order of 50% of the average electricity bill prior to the installation of the upgrades.

The program uses the PAYS® framework. PAYS® is an on-bill-financing solution developed by Clean Energy Works (CEW), an organization founded by Dr. Holmes Hummel, who served as the Senior Policy Advisor in the United States Department of Energy's Office of Policy & International Affairs from 2009 to 2013.

CEW approached REC with a win-win proposal describing how PAYS® could help build the local economy while providing cost savings, energy efficiency, and financial returns. Addressing socioeconomic and skills issues in the area is a high priority for local stakeholders.

The program has been successfully resolving the issues related to information technology, skills development, staff availability, and resource access that it faced initially. Its approach has included on-the-job training for contractors and other staff. Partnering with an organization that assists with implementation has made it easier for REC to run the program.

By the same token, while REC is aware of the other sources of value that such a structure can offer, it has yet to unlock these potential value streams. For example, PAYS® may be an attractive means of deploying a network of smart-meter solutions throughout REC's service territory.

By including a smart meter in the portfolio of energy solutions offered as a part of the Upgrade to $ave Program, REC may be able to better analyze and manage the electric system to create value in a variety of ways, such as strategic peak-load shaving.

Additionally, PAYS® could be used to provide other clean-energy solutions, such as strategic deployment of distributed energy, which could be used to reduce the costs associated with providing high-quality power in remote rural areas.

For example, efficiency losses are often a significant cost to electric utilities in remote regions, given the need to maintain the quality of power with high voltages through the last mile of transmission.

Strategic deployment of solar photovoltaics through the Upgrade to $ave Program could mitigate such costs and create value for the utility and customers across the board.

Such uses of PAYS® would not only create additional value for REC but would also accrue benefits to the customers, who in this case are also the ultimate owners of the cooperative.

Other rural regions with electric cooperatives could leverage a similar combination to create a stakeholder collaboration supported by USDA funding.

Problem

BACKGROUND

Energy-efficiency solutions have often been considered amongst the most attractive CO_2-emissions-abatement opportunities. Not only do they reduce the environmental and health damages associated with fossil-fuel emissions, but they also do so at a low—if not negative—cost per tonne of pollutant abated.

This is most famously illustrated in the Global Cost Curve developed by McKinsey and Company, which plots the cost of abatement options per tonne of CO2 against the total potential abatement from each option.

While the economic, social, and environmental investment basis for investment in energy efficiency is clear, there are significant barriers to investment in energy efficiency—particularly in the residential space—as a standalone asset class.

In REC's service territory and in many other rural areas, energy-efficiency-financing aggregation can pose some practical challenges in markets with single-family homes that vary in their age and technology.

High upfront capital requirements are a barrier for many households and contractors which may have limited access to low-cost capital, problems with insufficient creditworthiness, existing debt burdens or liens on assets, or competing demands for capital which may take priority.

Also, both contractors and residents are incentivized to cherry-pick the high-net-present-value/low-payback efficiency opportunities such as replacing incandescent lightbulbs with more efficient LEDs.

Such cherry-picking can make it difficult to conduct whole-home retrofits where the best projects cross-subsidize the lower-net-present-value/longer-payback opportunities.

In such situations, only the best projects are undertaken, leaving the less-attractive projects unfinanceable. Therefore, the benefit of a portfolio approach to energy efficiency, through which the benefit of the whole is greater than the figurative sum of its parts, is lost.

Also, on-bill-financing schemes in which the utility serves as a conduit that connects third-party capital providers to customers and contractors are also less-efficient solutions than this one. This is because the third-party providers would need to qualify customers based on metrics such as FICO scores. That would not only increase the administrative costs of such projects, but in doing so, would also decrease the universe of possible customers and projects.

NORTH CAROLINA

North Carolina is a state with relatively low residential electricity prices, ranking 40th out of the 51 states with average residential retail electricity prices of 11.13 ¢/kWh in June 2016 (DC was included).[1] This has gone up from 9.24 ¢/kWh in 2013.[2,3] In 2015, net electricity generation in the state originated from three primary sources:

1. Nuclear-generated power, comprising 32.6% of the fuel mix
2. Coal-fired power, comprising 31.4% of the fuel mix
3. Gas-fired power, comprising 28.3% of the fuel mix (with the balance coming from other energy sources such as hydroelectric power and other renewable energy)[4]

Most of the state's residents are customers of either Duke Energy or Dominion Power, which collectively supply the vast majority of the electricity consumed within the state.[5] North Carolina is also home to a number of smaller electric-power providers, including more than 70 municipality- and university-owned electric-power providers and 26 electric cooperatives.[6]

Since August of 2007, North Carolina has supported a demand-pull policy mechanism designed to induce innovation and increase the uptake of renewable-energy and energy-efficiency technologies across the state. This policy, known as the Renewable Energy and Energy Efficiency Portfolio Standard (REPS), was adopted as a technology-agnostic alternative to the feed-in-tariff policies that were commonly used in Western Europe in the mid-2000s and beyond.

Many states in the United States adopted a demand-pull approach because they believed that the European supply-push approach would lead to market inefficiencies at the taxpayers' expense, as policy makers and regulators would have the task of identifying and choosing the technological winners and losers. Many states such as North Carolina reasoned that the market itself would do a better job of identifying the best and most economic clean-energy solutions at the state level.

REPS supports the clean-energy goals of North Carolina by mandating required renewable-energy and energy-efficiency penetration rates for certain target dates. More specifically, all investor-owned utilities

1 U. S. Energy Information Administration. *Rankings: Average retail price of electricity to residential sector, May 2017 (cents/kWh)*. Retrieved from http://www.eia.gov/state/rankings/?sid=NC#series/31

2 U. S. Energy Information Administration. *North Carolina electricity profile 2015*. Retrieved from http://www.eia.gov/electricity/state/NorthCarolina/

3 U. S. Energy Information Administration. *Table 5.6.A. Average price of electricity to ultimate customers by end-use sector, by state, June 2017 and 2016 (cents per kilowatt-hour)*. Retrieved from http://www.eia.gov/electricity/monthly/xls/table_5_06_a.xlsx

4 U. S. Energy Information Administration. *North Carolina: Profile overview*. Retrieved from http://www.eia.gov/state/?sid=NC

5 North Carolina Utilities Commission. *North Carolina's public utility infrastructure & regulatory climate*. Retrieved from http://www.ncuc.commerce.state.nc.us/overview/Overview.pdf

6 Carolina Country. *A guide to North Carolina's electric power providers*. Retrieved from http://www.carolinacountry.com/images/downloads/guide-to-nc-electric-utulities.pdf

are required to supply at least 12.5% of 2020 retail electricity from eligible energy resources including solar electric, solar thermal, wind power, and hydroelectric power.[7]

REPS requires that municipal utilities and electric cooperatives supply at least 10% of their retail electricity from eligible energy sources by 2018. Up to 25% of these requirements can be met through the installation of energy-efficiency technologies, with this number increasing to 40% after 2021.

Solution

Roanoke Electric Cooperative (REC) is one of North Carolina's 26 electric cooperatives. REC serves approximately 16,000 rural customers and cooperative members across the Hertford, Bertie, Gates, Northampton, Halifax, Chowan, and Perquimans counties in the northeastern part of the state.[8]

In 2014, REC was contacted by CEW, which offered a promising business plan. Its goal was to not only help REC meet its requirements under REPS but also to decrease customers' electricity bills, support the local economy, and offer the utility the prospect of an attractive return on its investment. Residential bills averaged around $200 per month in REC's service territory.

The proposed business plan centered on the implementation of an on-bill financing solution called Pay As You Save® (PAYS®). The financing works as follows:

1. The utility invests in cost-effective energy upgrades at customer sites;
2. The customer pays nothing upfront for the upgrades, as the utility pays the installer with either third-party capital or on-balance-sheet capital which can be reimbursed later by third-party sources;
3. The utility uses a tariff to put a fixed charge on the customer's monthly bill that is less than the estimated savings generated by the upgrades, so the customer enjoys an immediate and sustained positive cash flow;
4. The tariff for the PAYS® charge automatically transfers to future customers at the site until the initial investment is recovered in full.[9]

Cost-effective upgrades would be identified during the energy-audit process using the OptiMiser Energy software (OptiMiser), a cost-effective solution developed by the Energy Efficiency Institute, Inc. OptiMiser identifies potential energy-efficiency-upgrade opportunities at a customer site and calculates the associated savings and payback period for each upgrade.[10]

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7 North Carolina Utilities Commission. *Renewable energy and energy efficiency portfolio standard (REPS)*. Retrieved from http://www.ncuc.commerce.state.nc.us/reps/reps.htm

8 NC Electric Cooperatives. *Roanoke Electric Cooperative*. Retrieved from http://www.ncemcs.com/co-ops/map/Roanoke.htm

9 Clean Energy Works. '*Pay As You Save' financing*. Retrieved from http://cleanenergyworks.org/blog/pays-financing/

10 Data from Clean Energy Works.

The team at CEW proposed that REC partner with two organizations to facilitate the implementation of this solution:

1. **Roanoke Center** (RC), a local not-for-profit organization that could serve as the Program Operator in charge of administering the program and paying contractors for their work on energy audits and upgrades at customer sites;
2. **Rural Utility Service** (RUS), an operating unit and subsidiary of the United States Department of Agriculture (USDA) with the express mandate of supporting the development of infrastructure improvements in rural communities—including electric infrastructure—through the provision of services and low-cost capital.

CEW envisioned the Upgrade to $ave Program as the perfect platform for achieving the goals of all the aforementioned stakeholders:

REC – works toward meeting its energy-efficiency goals under REPS while not only potentially earning an attractive return on its investment but also increasing customer and member satisfaction.

RC – provides a service that helps it further its mission of "…effectively mak[ing] the region a better place to live and work."[11]

Customers – realize an immediate and material saving on their electricity bills without needing to take on additional liabilities in the form of liens or other debt.

RUS – supports the development of local jobs and energy infrastructure through the provision of low-cost capital.

Contractors – are presented with an opportunity to both expand and diversify their service offerings.

CEW – succeeds in championing investment in innovative clean-energy solutions.

SYNERGIES

The PAYS® solution not only serves to address many of the challenges mentioned above, but it also solves several other issues including but not limited to the following:

- Principal-agent issues of two kinds:
    - Situations in which homeowners or landlords pay for capital improvements while the renter pays for the electricity bill—and thus both lack the incentive to undertake the investment
    - Situations where an agent such as an investor-owned utility is rewarded using a metric such as the number of kWh delivered and thus lacks the proper incentive to facilitate efficiency upgrades that are in the customers' best interests because they would run counter to shareholders' interests

11 Roanoke Electric Cooperative. *The Roanoke Center.* Retrieved from http://roanokeelectric.coopwebbuilder2.com/content/roanoke-center/home.aspx

- Information costs associated with identifying and initiating attractive projects because the utility may lack the incentive to connect stakeholders and provide resources even though it is the best entity to do so
- Problems with addressing many of these credit barriers that prevent customers and contractors from undertaking such projects on their own such as expenses, creditworthiness, debts, liens, and so on

PAYS® addresses these constraints in a number of ways. First of all, the utility is likely the entity in the best position to qualify customers for such upgrades. The utility has an existing relationship and history with the customers. It also has as additional leverage and security because of its ability to tie the repayment of the investment to the general provision of power. Default rates on electricity bills hover around 0.3% of all customers per year. This is about 1/10 of the default rate on unsecured loans.

The utility has better access to low-cost capital and is better equipped to manage the additional debt burden than the customers or contractors are. These advantages, coupled with the absence of the competing capital needs that might keep residential customers and contractors from undertaking some or all of the possible efficiency projects, mean that utilities are particularly well-suited to addressing the credit issues that are often a barrier.

PAYS® also addresses some of the agency issues mentioned above. Since the improvements are tied to the bill and not to a specific landlord or renter, the projects can be passed from one owner or renter to the next. Also, the active participation of the utility in the transaction ensures an alignment of incentives, as the utility can also derive benefits from the program. This is particularly true in the context of customer-owned cooperatives.

The inclusion of the utility also facilitates many non-financial aspects of the transaction, such as the reduction of search costs. The utility has existing market channels to the customer and thus can advertise both more effectively and with greater perceived legitimacy than a third-party capital provider could. Moreover, the utility does not need to seek any regulatory approval for a new product offering.

TERMS

The table below illustrates some of the basic terms of the Upgrade to $ave Program:

PROJECT TERMS	ASSOCIATED PARAMETER
Average Project Loan Life (years)	2 to 12
RUS Loan Term (years)	15
RUS Loan Size ($)	$6,000,000
RUS Loan Interest Rate[12]	U.S. Treasury Rate
Average Investment Cost ($/household)	$7,000
Minimum Bill Reduction (% of original)	75%

As the table above shows, REC has a great deal of security in its investment in addition to the points mentioned above. For example, the two-to-twelve-year average project life provides a tail period respectively at the end of the original project loan tenor. If the loan is not paid off in full during this period, then REC has a thirteen-to-three-year tail period in which it can continue to recapture its costs and try to make a project whole.

REC borrows at the U.S. Treasury Rate. This low cost of capital means that the universe of economically viable projects is greatly expanded. Also, the debt service associated with the projects is less necessary than it would be if the customer or contractor had obtained an unsecured loan from a private lender.

MODEL

The project origination process is a simple and important element of the transaction. REC takes a reactive rather than proactive marketing approach. Projects are typically identified and executed as follows:

1. A customer expresses some dissatisfaction with a particularly high electricity bill or with other services rendered by REC.
2. REC puts the customer in touch with RC if REC believes that the program may help to increase a customer's satisfaction with REC's service.
3. RC shares the program specifics with the customer.
4. The customer may express interest in and agree to an initial home suitability screening.
5. RC sends a representative who conducts a health and safety assessment of the home.

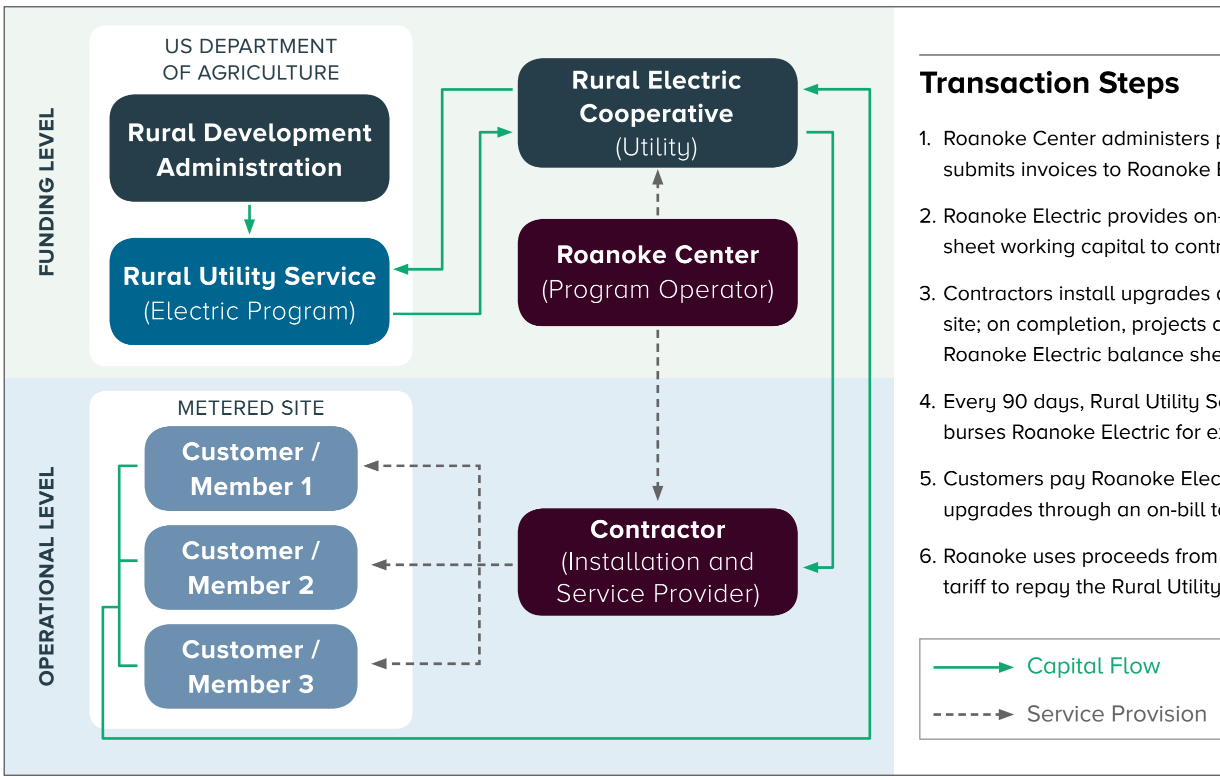
12 Jeff Schub. Personal communication, 9/19/2016.

A. If the home is unsuitable—for example, if there are serious structural defects such as a leaky roof—the representative directs customers to resources or contractors that can address these issues before proceeding.

B. If the home passes the health and safety assessment, then the representative authorizes an energy audit and assessment.

At this stage, at least three contractors are brought in to ensure that customers receive a competitive bid based on the home energy audit. The contractors use the OptiMiser software to assess the investment opportunity.[13]

If the projected savings are greater than 25%, than the customer can choose to opt into the program. At that point, REC uses its on-balance-sheet working capital to pay the contractors, who aim to provide the best portfolio of solutions given the customer's particular needs. If the projected savings from the suggested portfolio of whole-home retrofits do not result in reductions in the original bill of at least 25%, then the customer does not proceed with the upgrades.



Transaction Steps

1. Roanoke Center administers program and submits invoices to Roanoke Electric;
2. Roanoke Electric provides on-balance sheet working capital to contractors;
3. Contractors install upgrades at customer site; on completion, projects are held on Roanoke Electric balance sheet;
4. Every 90 days, Rural Utility Service reimburses Roanoke Electric for expenditures;
5. Customers pay Roanoke Electric for the upgrades through an on-bill tariff;
6. Roanoke uses proceeds from customer tariff to repay the Rural Utility Service loan.

Figure 1. Diagram based on interviews with Carol Rosenfeld (Environmental Finance Center at UNC Chapel Hill) and Holmes Hummel (Clean Energy Works).

13 REC has obtained a license that permits it to use the software at a cost of $25 per customer. REC retains the ongoing right to use the software to analyze the actual performance of the upgrades with those projected during the initial assessment for the purposes of fine-tuning the program.

Once the projects have been completed and have met all the predetermined milestones outlined in the agreement between REC and the contractors, they are transferred onto REC's balance sheet. Once every 90 days, REC can draw on the RUS loan to reimburse itself for costs incurred as a part of the program. At least half of the savings are then used to pay off the RUS loan balance, provide REC with a return on its investment, and provide the customer with at least 50% of the total savings.

While a Program Operator is not a necessary party to a PAYS® transaction, REC has enlisted the support of RC in this particular program, as it felt that RC could better administer the program on its behalf.

The diagram above provides a stylized illustration of the flow of capital and the relationship between all the entities who are a party to this transaction.

COMPLICATIONS

As an innovator, REC faced several challenges in designing and implementing the Upgrade to $ave Program.

One might expect that negotiating the financing of such a program would be a key complication given the fact that the structure has seldom been used before. However, the reality was that arranging the financing was one of the easiest tasks in putting the program together.

In our conversation regarding the arrangement of the financing, Dr. Hummel noted that REC requested a business plan during the first meeting between CEW and REC regarding Upgrade to $ave. Six weeks later, CEW brought two on-bill-tariff experts on board to help CEW draft the initial plan for the $6-million loan over the course of the next thirty days. Then, the plan was submitted to RUS. Only thirty days thereafter, RUS approved the plan in its entirety without any requests for revision.

The first significant challenge was associated with skills constraints stemming from shortages in the local market. At the project's conception, there was an insufficient pool of skilled contractors with experience in installing and maintaining the necessary goods and services from which to pick to ensure a competitive bidding process. To solve this problem, REC ran a number of educational workshops designed to bring local contractors up to speed on the latest equipment and installation techniques and provide other information.

Similarly, REC faced significant job-skills and information-technology constraints of its own. As a small electric utility with 63 staff members, REC lacked the project-management skills and the available bandwidth necessary to run the program. Enlisting RC as the Program Operator addressed these constraints. By doing so, REC could rely on RC to administer the day-to-day needs of the program without needing to make a big investment in information technology or additional employees.

FUTURE

While the Upgrade to $ave Program is a simple, elegant, and tantalizing clean-energy financing solution, it faces some structural barriers.

The fact that this program is designed to be reactive based on customer complaints rather than proactive based on marketing outreach greatly reduces its effectiveness.

As noted above, job-skills and information-technology constraints can serve as a barrier to replication and scalability. While REC can provide the Upgrade to $ave Program to its 16,000 or so customers, other utilities may lack a willing Program Operator such as RC and/or otherwise be unable to administer the program. Perhaps other potential Program Operators can step in to fill this gap.

Many potential locations face similar skills constraints including an insufficient pool of local contractors who can provide the necessary goods and services. Building job skills related to energy efficiency is an investment in the local workforce that can yield dividends not just for one program but for the local economy. In addition to giving contractors a more competitive skillset, this training also facilitates small-business development. It also improves the performance and quality of local housing stock. This is apart from its other benefits related to health improvements and climate resilience that are also financially valuable. So there are many reasons to fund local skills training.

The role of CEW cannot be understated in facilitating this transaction. CEW's advisory services were critical to getting this transaction over its figurative finish line. The support of similar organizations may be a necessary precondition to any future PAYS® structures in the United States.

The set of conditions that made this transaction possible in North Carolina do exist in some other locations. Rural electric cooperatives are common in some states. As an electric cooperative, REC is customer-owned and thus its incentives are closely aligned with those of its customers in a way that may not be true for municipality- or investor-owned utilities as mentioned above. USDA loans providing low-cost government capital are available in areas that are considered rural. Large parts of the United States meet these criteria.

This is a replicable model. To the extent that utilities are open to trying it, this market can develop and expand. It is important to note that the market for PAYS®-funded projects is still very immature. While utilities are not—in principle—against such schemes, as they can conceivably help them in meeting their energy-efficiency goals, utilities will vary in their openness about replication of this model. With that said, Upgrade to $ave has been a success to date. It offers a simple yet effective model that can be used as the basis for other models going forward.