Title: Assessing the Potential Impact of Direct-Pay Renewable Tax Incentives: Renewable Generation in Rural Electric Cooperatives

Abstract

Power generation in the United States comes from investor-owned utilities, rural electric cooperatives, or municipal utilities. The focus of this study is rural electric cooperatives: private, nonprofit organizations owned by its members. Rural electric cooperatives serve 13% of electric customers in the United States but have largely been excluded from incentivizing efforts to raise levels of renewable power generation – such as renewable energy tax incentives – due to their nonprofit status. The National Rural Electric Cooperation Association (NRECA) stresses that the US cannot meet emission reduction goals without nonprofit cooperatives and municipal utilities, who make up nearly 30% of the electricity sector. [1] Of the 2,938 electric utilities in the United States, 812 cooperatives (27.6%) serve 20 million customers across the country. [2] The purpose of this study is to evaluate the potential impacts and efficacy of cooperative access to direct-pay renewable tax incentives, a recent policy proposal for President Biden's "Build Back Better" package. This study chooses to focus only on cooperatives and excludes municipal utilities due to unique characteristics and challenges faced by rural cooperatives. Historical generation data cataloged by power source coupled with survey data will be utilized to draw conclusions on the impacts direct-pay access could have on levels of renewable generation in electric cooperatives. Mitigating factors such as planned asset retirements, planned renewable additions, and subjugation to state Renewable Portfolio Standards (RPS) will be evaluated against renewable generation additions due to direct-pay

incentive access. The data will be evaluated through regression analysis to identify variables with significant impacts on levels of renewable generation in a cooperative portfolio. Findings from the study will help to determine the efficacy direct-pay access for cooperatives would have in accelerating renewable generation growth.

Introduction

With President Biden's ever-growing push for the retirement of fossil assets and increased renewable penetration in the US grid [3], the focus has mainly fallen upon investor-owned utilities (IOUs). Electric cooperatives, originating from the Rural Electrification Act of 1936, serve 42 million people (13% of U.S. electric customers) and power 56% of the United States landmass [4]. Tax incentives aimed at increasing renewable generation in the country's grid have only been aimed at investor-owned utilities, independent power producers, and individuals due to cooperatives' lack of federal tax liability. Though investor-owned utilities serve the majority of US customers, attaining a renewable powered economy cannot happen without participation of cooperatives. An amendment for cooperative access for direct-pay tax incentives was included in the climate package passed by the House, but it stalled in the Senate.

There are several differentiating characteristics between cooperatives and investor-owned utilities, the most important being cooperatives' nonprofit status, governing principles, and low-density service areas. Electric cooperatives are governed by the seven cooperatives principles: Open and Voluntary Membership, Democratic Member Control, Member's Economic Participation, Autonomy and Independence, Education & Information, Cooperation Among

Cooperatives, and Concern for Community. Cooperatives were created to bring electricity to areas of the country with low population density that were not cost-effective for investor-owned utilities to serve; cooperatives average 6.6 customers per mile of distribution line whereas other utilities average 32 customers per mile of distribution line [5]. The nonprofit status of cooperatives presents a financial hurdle because they are not able to access the full value of renewable tax incentives, relying on partnerships with tax equity investors. Another significant financial hurdle to cooperatives is outstanding debt associated with coal plants [5]. While investor-owned utilities also face the burden of coal debt, they have built-in charges to customer rates for investors to earn a return [6], allowing them to utilize customer rates to pay off debt. The non-profit structure of cooperatives means that all costs of new investments and debt associated with existing assets are placed upon customers [7], which coupled with the low customer density of cooperatives, would mean cooperative customers would face unbearable costs to retire coal assets early. Exacerbating the issue of asset retirement and rate affordability is the fact that cooperatives serve 92% of persistent poverty counties in the US. [8]

Direct pay incentives were instituted under the Section 1603 Grant Program as part of the 2009 economic stimulus package and resulted in 34.6 gigawatts of renewable capacity [9]. However, the impacts of these direct-pay incentives were limited to investor-owned utilities. Direct-pay renewable tax incentives are a policy proposition that has regained popularity amidst the COVID-19 pandemic and economic slowdown. Because electric cooperatives have never been granted access to direct pay tax incentives, research evaluating the efficacy of direct pay incentives within the cooperative arena is essentially non-existent.

This paper will utilize historical and survey data to examine the potential impacts of direct-pay incentive access on levels of renewable generation in nonprofit electric cooperatives. This study utilizes data from the 63 generation and transmission cooperatives in the United States. Archival data from the EPA's eGRID regarding historical levels of renewable generation in cooperative portfolios will be examined alongside survey data. The survey asks cooperatives about portfolio changes in the form of planned retirements or asset additions, as well as how much renewable generation the cooperative would feasibly add given access to direct-pay incentives. Regression analysis of the data will determine whether direct-pay incentive access will significantly alter renewable generation in a cooperative power portfolio, or if other factors such as RPS standards or governing board decisions will have a greater impact.

Background

There are two types of electric cooperatives: distribution cooperatives and generation and transmission (G&T) cooperatives. Distribution cooperatives own and operate distribution lines, deliver electricity to end customers, and do not own any generation sources. G&Ts are owned by their distribution cooperative members and provide wholesale power or purchase power on behalf of their members.

Renewable tax incentives for power production at the utility level come in two forms: the investment tax credit (ITC) and the production tax credit (PTC). The ITC allows a qualified solar, fuel cell, or small wind project to claim a tax credit equal to 30% of the project's upfront costs. The ITC is typically used for solar projects because of high capital costs associated with solar energy [10]. The PTC provides credit per kilowatt hour of energy produced, and is typically utilized for landfill gas, open-loop biomass, and wind projects. The value of the PTC for wind projects can be up to 2.5 cents/kWh [11]. Direct-pay tax incentives offer projects the option to receive a one-time payment in lieu of the tax credit, meaning projects eligible for PTC could choose a 30% ITC or cash grant instead. Direct-pay tax incentives are a policy proposal that has regained traction in the past year as a method of increasing the effectiveness of incentivizing renewable development amidst the global pandemic and economic downturn.

Capacity factors of renewable projects relate to the average power output compared with the total project capacity; the average capacity factor for wind turbines in 2020 was 35.3% and 24.2% for photovoltaic solar [12].

In the context of renewable energy, tax equity investing refers to the "transactions that pair the tax credits or other tax benefits generated by a qualifying physical investment with the capital financing associated with that investment" (Keightley, Marples, Sherlock, 2019). For example, an investor in a solar project would front a portion of the up-front costs to establish part-ownership of the project and receive the tax benefits of the incentives. Because electric cooperatives are tax-exempt organizations, they must partner with tax-liable third parties for a renewable project to be eligible for tax incentives. [13]

Literature Review

In the conversation surrounding the transition to a renewable powered economy one of central questions is "what is holding organizations back from developing renewable capacity?" This literature review adds to the discussion of a transition to a renewable-powered economy by identifying key differences between electric cooperatives and investor-owned utilities that lead to a unique set of challenges and cost barriers for cooperatives, as well as a discussion of past direct-pay incentive efforts.

Cooperative Challenges

An empirical analysis of cooperative market structures [14], outlined four main cooperative characteristics that set them apart from investor-owned utilities and lead to higher costs of service (Greer, 2003). The rural nature of cooperative service areas is the first aspect affecting cooperative economics; customer density per mile is far lower for cooperatives and the larger residential customer load correlates to more costly power demands. The second characteristic affecting cooperative costs is the 85% rule, mandating that 85% of cooperative revenues come from their members in order to maintain tax-exempt status. This rule renders cooperatives with significant costs should they choose to participate in wholesale markets instead of selling power to members, and larger electric customers choosing to purchase from other power providers through retail choice lessens the likelihood of cooperatives repaying asset debts.

The third key difference outlined by the author is the regulatory environment surrounding cooperatives. Many states do not regulate cooperative rates through the state utility commission and any states with restructuring legislation often offer opt-out clauses for cooperatives. The author highlighted this difference against retail-choice markets due to the economic basis of the study, but an exploration of RPS regulation and why cooperatives are not always subject to RPS could help highlight cost challenges. The final difference between cooperatives and investor-owned utilities lies in the philosophical principles guiding organizations and differing strategies for over and under-performance. Cooperatives operate in accordance with the seven principles mentioned in the introduction of this paper, and investor-owned utilities are aiming to maximize profits. The author chose to evaluate this difference in regard to incentives for over and under-performance; an evaluation of business strategy against maximization of profit vs consumer welfare would shed additional light on cost challenges for cooperatives.

A qualitative report based on information provided by cooperative board owners, member-owners, and cooperative advocates (Farrell, Grimley, Stumo-Langer, 2016) found that the three main challenges faced by electric cooperatives are ties to coal power, long-term power contracts, and the loss of member-owners [15]. Historical events leading to cooperative ties with coal were the exponential increase in electric demand in the 1960-70s and oil scarcity in the 1970-80s. These ties come with the burden of stranded costs if cooperatives retire uneconomical assets before their debts are fully paid. This challenge ties in with the 85% rule brought up by Greer, as members of G&Ts are required to maintain nonprofit status, but don't provide sufficient cashflow to pay off coal assets early. The second challenge identified was long-term power contracts and the cost implications for cooperatives. The NRECA identified that 65-70% of cooperative power supply comes from "all-requirements" contracts, which lock distribution cooperatives into multi-year power supply contracts with G&T cooperatives and prohibit purchasing power elsewhere. G&T cooperatives have the authority to set their own rates within these contracts, so while the contract ensures power supply, it does not ensure low power pricing. Should cooperatives seek to exit these contracts, they are often faced with insurmountable costs, as seen in the $37 million exit fee given Kit Carson Electric Cooperative by Tri-State Generation and Transmission Association. The third challenge identified in the report was member participation at the board level; 72% of electric cooperatives experience less than 10% average turnout at meetings. Low member participation hinders the identification of strategies needing improvement or more support, further building up the barrier to addressing threats and identifying solutions to those threats. A further analysis of strategic priorities against member participation could highlight stagnant cooperative boards necessitating member input.

In a case study evaluating the specific challenges of the Pedernales Energy Cooperative [16], (Payne, Monast, Wiseman, Eason, 2017), identified the balance of rural and suburban/urban customers as the root of challenges with power infrastructure and equity, while the nonprofit structure of PEC limits incentivization of meeting energy goals. The differing customer profiles cause two issues in regard to new infrastructure developments. Mirroring Greer's identification of rural service areas as a challenge, the first issue is that the rural portion of members are not favorable towards bearing the cost for power infrastructure like electric vehicle charging stations that would primarily benefit the urban/suburban populations, but the urban customers are the drivers behind increasing revenue. The second infrastructure issue is that the low density of rural service areas automatically translates to higher costs per customer for power infrastructure development or upgrades. In regard to meeting energy efficiency goals, PEC does not have the authority to incentive energy efficiency, whereas the Austin municipal utility is able to mandate efficiency audits for customers.

The most significant commonality among the studies was the challenge that rural service territories pose to cooperatives in regard to higher cost of electric service and implications of long-term power contracts. While (Greer, 2003) discussed incentives against organization performance and (Payne, 2017) against customer efficiency and energy goals, both points highlight the lack of power cooperatives have when it comes to incentivization strategies.

Direct-Pay Renewable Energy Tax Incentives

The second theme explored in this literature review is direct-pay tax incentives. After the 2008 recession, direct pay tax credit for renewable projects were implemented as part of economic recovery [17], allowing cash grant options for renewable developers, but the program expired in 2011 and was not renewed (McLaughlin, Bird 2021). Because of the short time frame of this policy, there is little research on the impacts of direct pay incentives in comparison to traditional renewable tax incentives.

An analysis of the Section 1603 Grant Program of 2009 (CRS, 2011) outlined the basis behind the program, market response, and factors affecting the practical value of direct payments versus traditional tax incentives [18]. Section 1603 aimed to decrease reliance on tax equity investors in renewable projects and motivations for enactment of direct pay incentives today follow the same reasoning in the wake of the pandemic recession. The Section 1603 Grant Program awarded 3,801 participants a total value of $9.2 billion dollars. Solar projects received 81% of the grant awards (3,053), but only 13% of the total value ($1.237 billion). Wind projects were the recipient of 5% of grant awards (205) but had 79% of the total award value ($7.227 billion). In assessing wind installations through the period of the grant program, 10 GW of capacity were installed in 2009, the first year of the program, 5 GW in 2010, and 3.7 GW in the first three quarters of 2011, but due to the time frame of completion for a wind project, it is likely that many of the projects put into operation in 2009 would have been completed without Section 1603 grants. This point of the study is where the factors affecting cooperative economics and service costs come into play. Cooperatives do not have the level of upfront capital required to fund projects, whereas investor-owned utility projects didn't necessarily need the federal assistance to put their projects into service.

Under the Section 1603 Grant Program, renewable projects had the choice between traditional ITC, PTC, or cash grants. Another crucial finding was the practical value of Section 1603 grants compared to traditional tax incentives. The choice between PTC or ITC grant was dependent on the capacity factor and costs of the project; higher capacity factors led to a greater PTC value and higher capital costs led to greater value from Section 1603 grants. For solar projects, the four following factors led to a higher value of Section 1603 grants. Transaction costs refer to the potential requirement to monetize incentives at a discount to tax equity investors to realize the traditional 30% ITC, as well as business costs to fulfill the transaction, whereas direct payments only require an application to the U.S. Department of the Treasury. There is also increased value in not competing for deals with the limited number of tax equity investors in the market. The third factor, time value of money, refers to the more immediate cash flow (grants are typically paid within 60 days of application) provided by

Section 1603 grants compared to the ITC which is claimed when an organization files their tax return. The final factor influencing the higher practical value of Section 1603 grants is the taxable income risk; organizations that choose the traditional ITC face the burden of fulfilling the required level of taxable income in order to receive the full value of the credit and Section 1603 grants do not carry that risk.

The studies analyzed in this literature review contribute to a greater understanding of the unique nature of cooperatives and how those unique characteristics present different financial challenges in comparison to IOUs, as well as an analysis of direct pay tax incentives and the contributing factors that can result in a greater direct pay value compared to traditional ITC or PTC incentives. Strengths of existing studies include an in-depth analysis of organizational qualities that lead to cost impacts for cooperatives and a deeper evaluation of factors contributing to the success of direct-pay tax incentives. The main weakness in existing literature is that there is not research in the cross-section between cooperatives and direct pay incentives. Additionally, research on the Section 1603 Grant Program is limited due to the short time frame of the policy. It is difficult to apply the concepts outlined in analyses of direct-pay incentives to cooperatives because of the fundamental differences between cooperatives and investor-owned utilities conveyed in the first theme of studies. Because the non-profit structure of cooperatives prevents them from accessing the full value of renewable tax incentives and there was not a provision allowing cooperative access in the Section 1603 Grant Program, there is a complete gap in research on the impact of direct-pay tax incentives on renewable generation in cooperatives.

Access to direct pay incentives may encourage cooperatives to increase their renewable generation capacity, but incentives alone will not be the sole reason. Cooperatives with planned retirements of large assets and subjugation to state regulation will necessitate a greater renewable capacity addition than cooperatives not subject to state renewable standards or retiring significant assets. In addition, intangible factors such as board demographics may contribute to difference decisions regarding the direction of resource portfolios.

Data & Methods

The data this study will utilize is from archival sources and surveys. The archival data will be from the EIA-860 Form, which catalogs capacity data by source for every single utility in the country. The archival data is where the study will gather information regarding historical generation capacity for cooperatives by source. Survey data will be sent to 63 generation and transmission cooperatives. The questions in the survey will pertain to the amount of renewable generation the cooperative would feasibly add to their portfolio given access to direct pay renewable tax incentives. Survey questions will also ask about planned retirements, planned capacity additions, and subjugation to Renewable Portfolio Standards (see Appendix). Regression analysis will be performed on the data to determine variables with significant impacts on a cooperative's level of renewable generation. The analysis will also provide insight into the impacts that other variables such as RPS and planned portfolio changes have in comparison to direct-pay access.

Research Design

The research design chosen for this study is an interrupted time series design. An interrupted time series allows for evaluation of past renewable generation additions against the projected renewable additions given hypothetical access to direct-pay incentives. Electric cooperatives have been adding renewable generation to their portfolios for years, and while levels of renewable generation may vary across the population of G&Ts, it is crucial to evaluate the progression of renewable generation that has occurred without the incentivizing efforts of cooperative access to direct-pay incentives. Another reason this study utilizes an interrupted time series design is due to the exploratory nature of the research question. Establishing a cause-and-effect relationship between access to direct-pay incentives and renewable generation levels would be inappropriate given historical additions of renewable generation without incentive access. Rather, this study seeks to explore whether cooperative access to direct-pay renewable energy incentives would alter the amount of a cooperative's planned renewable generation additions. Due to differing service area size, load profiles, and current portfolio composition between G&Ts, this study is not aiming to generalize to all G&T cooperatives in the United States.

Study Population and Sample Selection

The population of this research study is electric cooperatives in the United States, specifically generation and transmission (G&T) cooperatives. G&T cooperatives own and operate power generation assets, while distribution cooperatives deliver power to end customers. Because direct-pay incentives apply to renewable generation projects, G&T cooperatives are the appropriate population. As of 2021, there are 63 G&T cooperatives in the United States, and surveys questions will be sent to all 63. Compared to the 832 distribution cooperatives in the country, G&Ts have a significantly lower population. Given the limitations of low survey response rates, selecting a smaller sample from the G&T population would further increase the likelihood of a small response pool.

Data Analysis Methodology

The archival and survey data will be evaluated through regression analysis in Stata. Historical generation data regarding levels of renewable generation in a cooperative's portfolio will be evaluated alongside survey results on renewable additions given cooperative access to direct-pay incentives. Regression analysis will allow for the identification of variables with significant impact other than access to direct-pay incentives, such as RPS standards. Historical total portfolio capacity and proportion of renewable generation will be collected from the EIA-860 Form, which catalogues capacity data for utilities each year. Capacity data will be pulled for the years 2012, 2014, 2016, 2018, and 2020.

Results

All four cooperatives indicated in the survey that access to direct-pay incentives would not increase planned renewable generation additions in the next five years. Thus, regression of generation additions with direct-pay access against planned retirements, planned generation additions, and RPS requirements yielded no results; a qualitative discussion of survey results will follow.

Historical Renewable Capacity Regression

```
. reg RenewCap Year TotalCap

      Source |       SS           df       MS      Number of obs   =        20
-------------+----------------------------------   F(2, 17)        =      1.24
       Model |  13134.0595         2  6567.02974   Prob > F        =    0.3147
    Residual |    90155.15        17  5303.24412   R-squared       =    0.1272
-------------+----------------------------------   Adj R-squared   =    0.0245
       Total |   103289.21        19  5436.27418   Root MSE        =    72.823

------------------------------------------------------------------------------
    RenewCap |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        Year |   .0779012   5.757196     0.01   0.989    -12.06872    12.22452
    TotalCap |   .0216149   .0137355     1.57   0.134    -.0073645    .0505943
       _cons |  -145.0365   11606.52    -0.01   0.990    -24632.65    24342.57
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In the regression of historical capacity data for the four cooperatives, the p-value was 0.3147; indicating that increases in the independent variables of time and total capacity do not explain variation in renewable capacity.

Historical Capacity Data

Arkansas Electric Coop Corp

	2012	2014	2016	2018	2020
Total Capacity (MW)	2,152.70	2,174.70	2,174.70	2,174.70	2,174.70
Renewable Capacity (MW)	167.4	167.4	167.4	167.4	167.4
Renewable Percentage of Total Capacity	7.776%	7.698%	7.698%	7.698%	7.698%

Great River Energy

	2012	2014	2016	2018	2020
Total Capacity (MW)	2,953.10	3,059.30	3,061.60	2,874.40	2,826.40
Renewable Capacity (MW)	0	0	2.3	2.3	2.3
Renewable Percentage of Total Capacity	0%	0%	0.075%	0.080%	0.081%

Sho-Me Power Electric Coop

	2012	2014	2016	2018	2020
Total Capacity (MW)	3	3	3	3	3
Renewable Capacity (MW)	3	3	3	3	3
Renewable Percentage of Total Capacity	100%	100%	100%	100%	100%

South Texas Electric Coop, Inc

	2012	2014	2016	2018	2020
Total Capacity (MW)	507.8	482.8	707.2	641.2	641.2
Renewable Capacity (MW)	0	0	0	0	0
Renewable Percentage of Total Capacity	0%	0%	0%	0%	0%

Survey Results

Cooperative	Planned Fossil Retirement	Planned Retire MW	Planned Generation Additions	Generation Addition MW	Renewable Addition MW	Fossil Addition MW	Direct-Pay Addition Change	Direct-Pay Addition Change
Arkansas Electric Coop Corp	No	0	No	0	0	0	No	0
Great River Energy	No	0	Yes	800	800	0	No	0
Sho-Me Power Electric Coop	No	0	No	0	0	0	No	0
South Texas Electric Coop, Inc	No	0	No	0	0	0	No	0

Analysis

The cooperatives analyzed in this study each had unique profiles, with capacity ranging from 3 MW to over 3,000 MW. Another interesting aspect of the historical capacity data was the presence of a cooperative with entirely renewable capacity (Sho-Me Power Electric Coop) and a cooperative with zero renewable capacity (South Texas Electric Coop, Inc). Sho-Me Power Electric Coop and Arkansas Electric Coop Corp's renewable capacity came from hydropower, which explains the constant capacity level from 2012 to 2020. Great River Energy is planning to add 800 MW of renewable capacity in the next five years but would not increase the addition with access to direct-pay incentives. Great River Energy was also the only cooperative subject to state RPS standards but meets 100% of their requirements through the purchase of

Renewable Energy Credits (RECs). One potential reason for cooperatives not planning any renewable capacity additions is because their energy demand has not increased enough to warrant development of capacity, or they may be meeting additional demand through purchases from other generators.

Limitations

The primary limitation of this study is low survey response rate. Surveys were sent to all 63 generation and transmission cooperatives; the survey received ten responses, four of which were complete. Thus, the study is not generalizable to all generation and transmission cooperatives in the United States. Another limitation is ownership of renewable energy vs. purchase of energy. Cooperatives may prefer to purchase power from renewable generators instead of spending the money to develop their own renewable generation. For example, Great River Energy does not own any wind generation, but purchases over 600 MW from other generators. A third limitation of this study is that it does not account for new transmission that would have to be built to connect renewable generation sources to the grid. Other impactful variables not evaluated in this study include the influence of self-governing cooperative structure and demographics of board. The demographic profiles and preferences of boards may have significant impact on the direction of power portfolios. The self-governing structure of electric cooperatives means that cemented opinions and views of generation sources may have a high level of influence over the makeup of power portfolios.

Conclusion

The findings of this study indicate that access to direct-pay tax incentives would not increase the planned generation additions or incentivize a cooperative to add renewable generation. Though this survey aims to be exploratory and not infer causal relationships, there are implications of findings that warrant discussion. Because cooperative responses indicated direct-pay access would not incentivize them to significantly increase their renewable capacity, other policy options such as loan forgiveness or securitization may be more viable alternatives to increase renewable generation levels in the United States.

Appendix

Survey Questions:

1. What is the name of your organization?
2. Does your organization have any planned retirements in the next 5 years from fossil generation?
    a. If yes, how many MW of capacity will be retired?
3. Does your organization have any planned generation additions in the next 5 years?
    a. If yes, how many MW will be added to your organization's power portfolio?
    b. Of the generation additions, how many MW will be from renewable sources?
    c. Of the generation additions, how many MW will be from fossil sources?
4. Is your organization subject to state Renewable Portfolio Standards (RPS)?
    a. If yes, what percentage of renewable generation is required?
    b. What percentage of RPS requirement is your organization meeting through Renewable Energy Credits (RECs)?

5. Assuming direct-pay tax incentives become available to your organization (at the rate of 2.5 cents/kWh production tax credit or 30% investment tax credit) would that change the MW of renewable generation to be added to your organization's portfolio in the next 5 years?
    a. If yes, how would access to direct-pay incentives change the amount of renewable generation additions planned in the next 5 years?

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