Ballot Proposition C-04-2018
Clean Energy for a Healthy Arizona
Fiscal Analysis

Estimated Impact

A.R.S. § 19-123E requires the Joint Legislative Budget Committee Staff to prepare a summary of 300 words or less on the fiscal impact of voter-initiated ballot measures. The proposition would amend the Arizona Constitution to establish a renewable energy requirement for electric utilities regulated by the Arizona Corporation Commission. Currently, the Commission requires their regulated utilities to get 8% of their electricity for retail sales from renewable sources and raises that standard to 15% by 2025. Proposition xxx would instead require these utilities to increase their electricity for retail sales from renewable sources to 12% in 2020 and to 50% in 2030. The proposition would require 10% of retail electricity sales to be from renewable energy resources produced on the customer's premises by 2030.

Proposition xxx's fiscal impact is difficult to quantify in advance, especially since it would not be fully implemented until 2030. In the intervening years, technology changes may significantly affect the cost of producing both renewable and non-renewable energy. In addition, current studies have produced varying estimates of the economic impact of higher renewable energy requirements.

By revising the mix of energy sources used to generate electric power, Proposition xxx may directly affect the following:

- Retail electricity prices: Retail electricity sales are subject to the state's sales tax, and price changes may affect revenue collections. To the extent that government agencies are consumers of electricity, price changes may also affect their expenditures.
- Employment in energy production industries: Employment changes may affect state income tax collections.
- Assessed property value for energy production facilities: Electricity infrastructure is subject to property taxes, so any changes in such infrastructure may affect property tax collections.

The revised mix of energy sources may have other impacts on business profits and consumer disposable income that would potentially affect state revenue collections.

Background

The Arizona Corporation Commission (ACC) regulates the generation and distribution of electricity by investor-owned utilities and electricity cooperatives. These entities are required to have their retail electricity rates approved by the ACC. The ACC does not have authority, however, over electric service provided by a city or municipality, agricultural improvement district, irrigation district, electric district, or utilities operated by tribal authorities, which are instead overseen by elected governing boards. The ACC also does not have direct authority over "behind the meter" electricity providers that have power leases or purchase agreements with electricity customers for distributed generation.

The Energy Information Administration (EIA) of the U.S. Department of Energy estimates that Arizona had retail electricity sales of approximately $8.1 billion in 2016. Of that amount, EIA estimates that $4.9 billion, or 60% of retail sales revenue, was received by investor-owned utilities or cooperatives regulated by the ACC. Retail sales includes purchases of electricity from residential, commercial and industrial customers.

Electricity service providers regulated by ACC are currently subject to a renewable energy standard and tariff (REST) that requires those utilities to gradually increase the share of their electricity procured from renewable sources to 15% by 2025. Renewable energy resources include an energy resource, such as solar, wind, biomass, that is replaced rapidly by a natural, ongoing process and that is not nuclear or fossil fuel.

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Under current ACC requirements, utilities must procure 3.0% of their energy from "Distributed Renewable Energy Resources" by 2020, which include renewable technologies that provide electricity at the customer's premises, such as rooftop solar panels. That standard increases to 4.5% in 2025.

The ACC administers the REST program by creating "renewable energy credits" for each unit of procured renewable and distributed renewable energy. The total amount of credits is then compared to the total kilowatt hours (KWh) of retail electricity sold by the utility each year to determine compliance with the REST program. Utilities are permitted to transfer renewable energy credits to other entities, and once a credit is earned, it can be used in any year.

Utilities are required to file a tariff with the ACC that includes methods for recovering the costs of complying with the renewable energy standard. The tariff covers the incremental costs of renewable resources above the cost of conventional resources as well as the financial incentives paid by affected utilities to residential and non-residential adopters of distributed generation.

Proposition xxx would amend the ACC's renewable energy requirement incrementally from 12% in 2020 to 50% by 2030 and would increase the distributed renewable energy requirement from 3% in 2020 to 10% by 2030. *Table 1* shows how the requirements of the proposition compare to the current REST program. As with the REST program, the proposition would only apply to electric service providers that are regulated by ACC, and would be enforced via a system of credits for renewable energy and distributed renewable energy. The ACC would be required to adopt rules to implement the changes on or before December 31, 2019. Affected utilities would be required to submit annual compliance plans. Pursuant to existing state statute, failure to comply could result in civil fines of up to $5,000 per violation.

Table 1

Renewable Energy Standards
Percent of Retail Electricity Sales

	Current Renewable Energy Requirement	Proposition 127	Change to Current Program	Current Distributed Generation Standard 1/	Proposition 127	Change to Current Program
2020	10%	12%	2%	3.0%	3.0%	0%
2021	11%	14%	3%	3.3%	3.5%	0.2%
2022	12%	16%	4%	3.6%	4.0%	0.4%
2023	13%	20%	7%	3.9%	4.5%	0.6%
2024	14%	24%	10%	4.2%	5.0%	0.8%
2025	15%	28%	13%	4.5%	5.5%	1.0%
2026	15%	32%	17%	4.5%	6.0%	1.5%
2027	15%	36%	21%	4.5%	7.0%	2.5%
2028	15%	40%	25%	4.5%	8.0%	3.5%
2029	15%	45%	30%	4.5%	9.0%	4.5%
2030	15%	50%	35%	4.5%	10.0%	5.5%

1/ The REST program requires that 30% of the renewable energy requirement satisfied with distributed generation.

Analysis

To the extent that there are cost differences between producing electricity from renewable energy sources and non-renewable energy, the proposition could impact the price of retail electricity sold in Arizona. The EIA

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estimates that, in aggregate across US electricity markets, the cost of electricity produced from new generating stations coming online in 2022 is $46.50 per megawatt hour (MWh) for solar photovoltaic and $37.00/MWh for wind, including the impact of federal renewable energy tax credits. Excluding federal tax credits, the costs increase to $59.10/MWh for solar photovoltaic and $48.00/MWh for wind. The EIA estimates represent the "levelized cost of electricity," which is the cost per unit of electricity produced over an assumed 30-year period. The costs for solar and wind are largely driven by upfront capital expenses due to the lack of fuel costs and minimal fixed operating expenses. By comparison, EIA estimates the cost of electricity of new natural gas generating stations is $48.10/MWh. Natural gas generating stations have lower upfront capital costs than solar and wind, but have higher variable costs due to fuel expenses.

While the above estimates represent the average costs for new solar, wind, and natural gas generators, future costs are subject to significant uncertainty due to technological development. Costs for renewables have changed significantly in recent years as the technology has become more widespread. For example, the EIA estimates that the per unit cost of electricity for solar photovoltaic technologies excluding tax credits declined from $130.00/MWh in 2012 to $59.10/MWh in 2018. Costs could also increase, however, if utilities install new production facilities in areas with lower availability of sun or wind compared to current generation locations. Any cost changes in natural gas or other conventional resources would also impact the economic viability of renewable generation.

The EIA also cautions, however, against directly comparing the costs of solar and wind with natural gas and other conventional resources due to differences in "dispatchability." Dispatchability refers to the ability of grid operators to bring a generating station online or change its output at a specific time to match changes in supply or demand throughout the day and year. Natural gas generating stations are classified by the EIA as dispatchable, while solar and wind resources are considered non-dispatchable because such technologies only produce electricity when sunshine or wind is available. According to the EIA, dispatchable electricity generators "generally have more value to a system" because grid operators must continuously ensure that the mix of resources generate an amount of electricity that matches demand to ensure proper functioning of the grid.

To ensure that electricity demand continues to match supply with higher levels of renewable production, grid operators may invest in infrastructure to enhance operational flexibility of the grid. Such investments could include storage technologies, such as batteries or thermal storage, that can shift use of electricity from non-dispatchable resources to different times of day. There also could be additional investments in transmission infrastructure to facilitate exports of electricity at times when there is excess electricity being supplied to the grid.

The impact of the non-dispatchability of renewables, and any associated infrastructure needs, would depend on which existing resources would be displaced by renewable energy. Coal and nuclear generating stations are generally dispatched 24 hours a day, 7 days a week due to their relatively low variable costs, high fixed costs, and technical features, while generation from natural gas plants can be more readily adjusted to follow changes in demand. As a result, displacement of coal or nuclear generating stations would have different impacts on grid operations and electricity costs than displacement of natural gas generation.

National Studies

Given the complex mix of factors that affect the costs of renewable production compared to other technologies, studies have attempted to estimate the impact of renewable energy requirements (also called "Renewable Portfolio Standards (RPS)) on total electricity system costs in a certain jurisdiction instead of comparing the costs of different generating technologies in isolation. There are currently 30 states, including Arizona, that have mandatory minimum renewable energy portfolio standards (RPS). Of those states, California and New York have enacted RPS of 50% by 2030.

While there are several studies of the impact of RPS policies on retail electricity prices, we focused on 2 analyses of RPS policies from the Lawrence Berkeley National Laboratory and the National Renewable Energy Laboratory

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(NREL), which are affiliates of the U.S. Department of Energy. Both studies provide a broad-based analysis of RPS cost impacts across several states.

The Berkeley Lab study focuses on estimates of existing RPS compliance costs using data from state public utility commissions. According to the analysis, the weighted average costs of current RPS compliance based on data from utility commissions amounted to approximately 1.6% of retail electricity prices in the 30 states with RPS standards. The study included the cost of Arizona's renewable energy standard, which was approximately 4% of retail electricity prices in 2015 and 5% in 2016, respectively. The analysis cautions, however, that these estimates from utility commission data are only "rough" indicators of retail rate impacts because compliance costs for utilities are not necessarily passed through to retail rates paid by consumers. These estimates may not also consider other impacts, including the "merit order effect" (electricity is generally dispatched to the grid in order of lowest marginal cost, which generally favors renewables like solar and wind due to their lack of variable costs) or transmission costs associated with integration of renewable energy.

Interpreting these costs is also difficult, as the Berkeley Lab notes that there are widely varying methodologies employed by states in determining compliance costs. For example, the California Public Utility Commission estimates that the RPS in their state generated savings equivalent to less than (1)% of retail electricity prices for the state's 3 major investor-owned utilities in 2015 based on a cost-comparison of renewables with new natural gas facilities. California utilities, on the other hand, estimated a cost of approximately 11% of average retail prices based on the cost of renewable production compared to purchases on wholesale electricity markets.

The second study from the Berkeley Lab and NREL includes a prospective analysis in 2016 of increasing the stringency of state renewable portfolio standards, and similarly found that renewable portfolio standards generate electricity system costs. In a scenario where renewables account for 35% of electricity production in 2030 and 49% in 2050, the study estimates an increase of 0.6% to 4.5% in total electric system costs over and above a scenario with no RPS policies in place. The analysis uses the NREL's Regional Energy Deployment System (ReEDS), which incorporates all electric infrastructure and operating costs, including integration of utility-scale renewable energy into the transmission grid.

While the second study suggests that increasing the stringency of the renewable portfolio standard would increase costs, the authors note that the analysis did not include an analysis of state RPS policies individually, so these estimates cannot be extrapolated directly to Arizona. In addition, the 50% standard by 2030 required by the proposition is more stringent than the scenario assumed in the study.

Arizona Studies

Given the challenges in extrapolating from national studies to estimate the impact of the proposition, we also examined recent studies from the Natural Resources Defense Council (NRDC) and the Seidman Research Institute that attempted to model the impact of the proposition, specifically in Arizona. We do not have the independent capability to develop an Arizona-specific model of how the proposition would affect grid operations and associated costs of electricity, so we cannot replicate the results of these studies. The two studies focus on different economic and system impacts, and therefore are not directly comparable.

For both the NRDC and Seidman study, we view the long-term impacts even through 2030 as highly speculative. Significant changes in the technology and costs associated with renewable and non-renewable resources are possible within the next decade. Such changes cannot be determined in advance.

The ultimate impact of any electricity system cost changes on retail electricity prices would depend on the ACC's approval of rate changes. The proposition does not establish a methodology to be used by the ACC to evaluate potential retail rate adjustments resulting from the proposition, so we cannot determine in advance how the ACC would evaluate potential retail rate adjustments associated with the proposition.

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NRDC states that their study used a model developed by an energy consulting firm to determine the impact of the proposition on electricity production and retail sales in Arizona. The inputs to the model were supplied by NRDC using data from the EIA and NREL's Annual Technology Baseline. Because the Annual Technology Baseline includes a range of different costs for generating technologies depending on their specific technical features (e.g., for natural gas, the cost varies significantly based on inclusion of carbon capture and storage technology, combined cycle versus combustion turbine production, capacity factors, etc.), we do not know the exact cost inputs used by NRDC. Based on NRDC's assumptions, the study concluded that the proposition would result in average annual reductions equivalent to $(195) million of retail electricity prices, or approximately (2.4)%, between 2020 and 2040 relative to an alternative scenario of expanded natural gas production. The savings, according to NRDC, are primarily attributable to the lack of fuel costs and minimal operating expenses of solar compared to natural gas plants.

In contrast the NRDC study, the Seidman study focuses on the effects of the proposition on broader economic impacts. Arizona Public Service (APS) supplied projections of their operational and capital investment costs under the proposition as well as in a "business as usual" scenario. These APS-supplied costs are not specified in the study. Seidman used the APS estimates as inputs into a Regional Economic Model Inc. (REMI) of Arizona's economy to forecast the impact on gross state product (GSP), disposable personal income, and employment. REMI is a well-known econometric forecasting tool. GSP is the state-level equivalent of the Gross Domestic Product and is an estimate of Arizona's economic output in terms of the value of all goods and services produced in the state.

The APS-related GSP impacts differ by time period. In 2017, the total gross state product was $320 billion. Between 2019 and 2024, Seidman estimates that the proposition would increase Arizona GSP by an annual average of $460 million. Between 2024 and 2030, Seidman projects annual GSP losses of $(990) million. In 2031, the forecast loss is $(1.87) billion and it gradually declines to $(680) million by 2060.

The Seidman study does not specify the reasoning behind the short-term economic gain through 2024 and the losses thereafter. We speculate that the gains may be related to capital investment associated with enhanced solar production. The subsequent losses may in part be related to the decommissioning of the Palo Verde nuclear power plant.

Since Seidman only had the inputs from APS, they extrapolated those results to the remaining utilities regulated by the Corporation Commission. The Seidman statewide projection is less detailed and only contains an aggregate GSP forecast by decade. Seidman's statewide annual average GSP loss is projected to be $(840) million between 2021 and 2030. We are reviewing the methodology used in deriving these extrapolated estimates.

Seidman also converted the broad economic impacts into state and local tax impacts. Between 2019 and 2024, the APS-related state and local tax impact is projected to be an annual average gain of $37 million. Between 2025 and 2030, the average annual loss would be $(80) million. On a statewide basis, the state and local governments would lose an average of $(68) million in revenue annually between 2021 and 2030. As Seidman's revenue change per $1 of GSP change is greater than JLBC Staff's standard rule of thumb for revenue and GSP changes, we are continuing to analyze their methodology.

Fiscal Impacts

While the magnitude and direction of the impact of the proposition is highly uncertain, we expect that any change in the retail sales of electricity could affect collections of sales taxes, individual and corporate income taxes, and property taxes. The potential impacts are described in more detail below.

Sales Tax

The gross proceeds from sales or gross income from providing retail electric customers ancillary services, electric distribution services, electric generation services, electric transmission services and other services related to

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providing electricity are subject to Transaction Privilege Tax (TPT) collections under the Utilities classification. Utilities comprised approximately 8% of state TPT collections in FY 2017, of which approximately 75% is attributable to retail electric sales.

To the extent that the proposition has an impact on the retail price of electricity as described above, the proposition would impact state and local TPT collections. Distributed generation could reduce retail sales of electricity because individuals or businesses with their own distributed renewable generation system would purchase less electricity from utilities. Distributed generation provided pursuant to power purchase agreements or leasing agreements with independent power producers would continue to be subject to TPT. In addition, to the extent that there are fewer customers directly purchasing electricity from the grid, there could be retail price increases authorized by the ACC to reflect the fixed costs of the grid, which would at least partly offset impacts to the tax base from increased distributed generation.

Individual/Corporate Income Tax

Electricity price changes could affect business costs, which in turn could impact corporate income tax collections as well as individual income tax collections from "pass-through" entities. Any resulting changes in business costs and disposable income could be associated with broader economic impacts that would also impact revenues.

There could also be increases in income tax collections from jobs associated with new renewable generating stations as utilities develop infrastructure in their efforts to comply with the proposition. Any growth in such employment could be offset, however, by declines in employment for existing generating stations. The Seidman study estimates that by 2024 employment would grow by 9,500 relative to APS' business as-usual-scenario. This estimate includes both direct jobs in the energy sector as well as indirect employment. By 2030, however, the study estimates a net decline in employment of (15,900) relative to the business-as-usual scenario. We are seeking more details on these estimates to better evaluate these impacts.

The proposition could also affect utilization of various individual and corporate income tax incentives for renewable energy investment, production, and installation. For example, the increase in distributed generation required by the bill could increase use of the state individual income tax credit for residential solar energy devices, which provides a credit for 25% of the purchase price of a qualified solar energy device, with a maximum credit of $1,000 per year. There is also an individual and corporate credit available for production of renewable energy, but the Department of Revenue (DOR) has already approved the maximum $(20.0) million in aggregate credits available for such production, so the proposition would likely not have an impact on this latter credit.

Property Tax

According to DOR, gas and electric utilities and electric cooperatives had net assessed value of $3.5 billion for TY 2018, or about 5.7% of the statewide property tax base. To the extent that the proposition shifts electricity generation away from generating stations of non-renewable resources to utility-scale renewable generation, there could be impacts to the property tax base.

In general, renewable energy generating stations tend to be smaller in scale than non-renewable resources, which would tend to decrease property values. For example, in its *Annual Energy Outlook 2018*, the EIA assumes an average "overnight cost" (i.e., construction costs excluding financing expenses) of $2,105/KWh for photovoltaic solar generators and a maximum capacity of 150 megawatts. That would result in an estimated construction cost of approximately $316 million. A natural gas generating station, on the other hand, is assumed to have an overnight cost of $1,108/KWh and a maximum capacity of 429 megawatts, generating an implied construction cost of $475 million.

Even if individual renewable generating stations are smaller in scale than non-renewable energy sources, however, it remains challenging to project total property values associated with electric infrastructure. Substitution of non-renewable generation with renewable generation would need to be sufficient to meet total electricity demand.

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While smaller in scale, there would need to be more solar generating stations than conventional generating stations.

In addition to impacts on the aggregate value of the tax base, the proposition could result in property tax shifts between local taxing jurisdictions if renewable energy production has a different physical location than existing non-renewable generating stations.

Impact on State and Local Expenditures

The proposition could impact state and local expenditures on electricity. At the state level, the Arizona Department of Administration is appropriated $7.6 million for utilities costs for state-owned buildings, most of which is associated with electricity costs. This amount does not include utility costs associated with state government leases of privately owned buildings, facilities operated by the Arizona Department of Transportation, or buildings operated by the universities. There could be similar impacts on electricity purchases for local governments, including school districts, cities, and counties.

The Arizona Corporation Commission may incur costs in administering and enforcing the proposition. The Commission has not yet responded to our inquiries regarding such costs.

Other Impacts

By increasing the share of Arizona's electricity generated from renewable resources, the proposition could affect the environmental impacts of electricity production in Arizona, such as air quality and its associated health effects. We are unable to estimate any state costs or savings associated with such impacts, as we cannot precisely model changes to the electricity production and the grid that would occur as a result of the proposition.

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