Arizona's 'Clean Energy' Initiative: All Pain and No Gain





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Introduction

Proposition 127 on Arizona's statewide ballot this November will ask voters if the state constitution should be amended to require that utilities and electric co-operatives generate at least 50 percent of their annual sales of electricity from renewable energy sources by 2030—up from 15 percent today. Supporters of the so-called "clean energy" initiative say the result will be "lower costs, cleaner air, and healthier future," all at little or no cost to the state.

This study examines what has happened in other states and where such renewable energy mandates have been imposed. The same claims now being made in Arizona by Tom Steyer, the National Resources Defense Council (NRDC), and other advocates of Prop. 127 have been made elsewhere. Alas, the financial reality is vastly different from the rhetoric of the supporters. In nearly all cases where renewable mandates have been imposed, electric bills have risen far faster than in states without renewable energy mandates. We also find that states with mandates of 50 percent or more renewable energy charge rates (as would be required by Prop. 127) have residential electricity rates about 40 to 50 percent higher than in states without such requirements. And in states with extremely high mandatessuch as California-families and businesses sometimes pay nearly double the rate of that in states without mandates.

Of course, some states have higher utility costs than others for a variety of reasons, but we find that renewable energy mandates are clearly a factor.

Another major finding of this study is that lower-income families would be most adversely affected by Prop. 127. This is because poor households typically pay four to five times more of their income in energy costs than do wealthy families. Middle-class families pay at least twice as high a share of their income in energy bills than do the rich. For this reason, the "Clean Energy" initiative is best thought of as a regressive tax imposed on those who can least afford it. This "tax" could cost middle- and lower-income Arizona families about \$1,000 more per year in utility prices.

Studies by groups such as the NRDC argue that Prop. 127 will create thousands of jobs and incentivize billions of dollars of new investment spending, but these studies examine only the benefits, without assessing the high cost to other Arizona businesses and families. For example, tens of thousands of jobs could be lost in the coal, nuclear, and natural gas industries because utilities are forced to use less power from these sources.

Also ignored is the effect of higher utility prices on Arizona's schools, hospitals, and businesses. Because energy bills are a primary "cost of doing business," the mandate will chase some businesses and operations out of the state in favor of areas with lower power costs. Renewable energy mandates are a "green" tax on Arizona's manufacturing businesses, schools, and universities. As such, the state's tax revenues also take a hit, making it harder to fund schools, roads, and healthcare.

These costs might be worth it to Arizona voters if the initiative were going to deliver substantial environmental benefits to the state. A final conclusion of this analysis is that the advertised environmental benefits are vastly overstated and any improvement in the state's already improving air quality will be minimal. This is because Prop. 127 crowds out two of the cleanest forms of energy production: natural gas and nuclear power. Nationally, the move toward domestically produced natural gas has been the primary driver of improvements in U.S. air quality and reduced greenhouse gas emissions. Replacing natural gas, nuclear power, and clean coal is a risky and high-dollar gamble that could lead to a financially unhealthy future for Arizona.

How Does Prop. 127 Work?

Proposition 127 will appear on the ballot in Arizona in November and if approved would amend the state constitution to require that utilities and electric cooperatives generate at least 50 percent of their annual sales of electricity from renewable energy sources by 2030. This would require half of the power to come from mostly wind and solar power. Today, the state gets about 15 percent of its energy from renewable energy, so reaching 50 percent would be a steep climb over a decade. It means the state would have to more than triple its renewable energy output in just 12 years. Existing utilities would need to be retrofitted to deliver greater quantities of renewable energy (primarily wind and solar). The measure would also override Arizona's current structure for regulating utilities, which has been in effect for many decades.

Supporters—including 127's chief financial sponsor, Tom Steyer of California and many environmental groups, such as the NRDC—argue that the transition to renewable energy would be "gradual" and that the price of solar and wind power is expected to fall in the future, so the cost of this new system would be minimal to ratepayers while providing Arizona residents with cleaner air. They also argue that the construction of solar and wind energy projects could lead to the creation of as many as 15,000 new jobs.¹

Opponents—including the Arizona Chamber of Commerce and some consumer groups—say that Prop. 127 would disrupt an electric power system that has "provided Arizona residents with some of the safest, most reliable and affordable energy in the country for over 100 years."² They also fear that this mandate for solar and wind power could substantially increase electricity bills and would raise costs to businesses and schools, imposing a dramatic financial burden. The major utility in the state, APS, warns that Prop. 127 could lead to a shutdown in coal and nuclear power plants that have safely provided reliable and affordable energy for decades, while leading to the loss of high-paying energy jobs.³ In particular, opponents warn that the initiative could force a shutdown of the Palo Verde Nuclear Generating Station, thereby threatening 3,000 jobs. Palo Verde generates about two-thirds of Arizona's carbon-free energy and releases almost zero emissions into the air. The plant generated 32.3 million megawatt hours of energy in 2017, more than any other plant in the United States.

The Experience of Other States with REMs

Arizona is hardly the first jurisdiction to consider a renewable energy mandate, or REM, so it's useful to see what's happened in other states. Today, some 30 states comprising two-thirds of America's population have an REM, while the rest do not. These mandates range from 50 percent in at least four states to as low as 10 percent in others. One purpose of this study is to compare rates in states with and without REMs to determine whether there is a difference in rates.

We also examine whether rates have risen, fallen, or remained the same after states have adopted REMs.

Let us start with the comparison between high-rate states and low-rate states using the U.S. Energy Information Administration's (EIA) latest residential data, from June 2018.⁴ We find that of the 10 states with the highest residential electricity rates in the country, nine have REMs. Of the 10 states with the lowest electric power rates, seven do not have REMs. The highest rates on average are double the figures of the lowest rates.⁵

The initiative also has a requirement that 10 percent of utilities' renewable generation come from technology like rooftop solar, the least efficient and most expensive form of solar.⁶



Renewable Energy Mandate States Have Higher Electric Power Costs in 2018

Most Expensive States:

State	REM Category 2018	Electricity Price (Cents per Kilowatthour)
Hawaii	High	32.76
Alaska	No	22.54
Connecticut	High	21.62
Massachusetts	High	21.11
California	High	19.90
New Hampshire	High	19.63
New York	High	19.30
Rhode Island	Low	18.64
Vermont	Low	18.50
Maine	High	16.16
Average	-	21.02

*9/10 have a mandatory REM. Alaska is the only one that does not.

Least Expensive States:

State	REM Category 2018	Electricity Price (Cents per Kilowatthour)
Louisiana	No	9.37
Washington	Low	9.79
Arkansas	No	9.99
Kentucky	No	10.56
Idaho	No	10.58
Utah	No	10.63
Oklahoma	No	10.72
Tennessee	No	10.79
Oregon	High	11.02
North Carolina	Low	11.24
Average		10.47

*7/10 have no REM.



Next, we compare the states with the most stringent REMs (50 percent renewable or more) versus states with low REMs (less than 50 percent), and then with states with no REM. Here we find the same pattern.

States with high REM have rates that are about 30 percent per kilowatt hour more expensive than states with low REMs, and about 80 percent higher than states with no REM.



Source: Energy Information Administration, 2018.

This could easily mean a difference of about \$500 to \$1,000 a year in higher utility bills for a middle-class family. It could mean tens of thousands of dollars of higher costs for a business, depending on energy usage. For manufacturers, it could mean \$100,000 or more of extra costs.

The difference in prices in states with low REMs and states without REMs is fairly small. This suggests that modest and attainable REMs do not impose a substantial burden on homeowners and businesses, because most states already purchase about 10 to 20 percent of their power from renewable energy sources.

While there are many reasons why some states have higher utility rates than others, the evidence clearly shows that states aiming to keep utility costs low would be wise to avoid stringent renewable energy mandates.

One might argue that states with REMs already had high energy costs to begin with, and therefore it is important to not just compare prices across states, but also to examine what happens to state utility prices before and after they adopt REMs. Do prices rise faster in these states than in states that avoid REMs? The answer is yes.

A landmark study by the Manhattan Institute published in 2012 compared what happened in states with high coal use when they were forced to adopt REMs and shift composition to wind and solar.⁷ The study discovered that in 2001, the average price of residential electricity in the coal-dependent REM states was 10.9 percent higher than the average price in the coal-dependent non-REM states. By 2010, that differential had more than tripled to 37.6 percent. In other words, over a decade, the REM states saw a tripling in the price differential with the no REM states. In almost all the states that adopted REMs, the environmental groups had promised that prices would not rise from the mandates because of technology improvements in solar and wind. Those are very similar to the claims being made by the NRDC today in Arizona.

The California and New York Experiences

California, which moved to a 50 percent renewable energy mandate in 2015, now charges residents roughly 20 cents per kilowatt hour. That is the fifth-highest rate in the country (only Hawaii, Alaska, Connecticut, and Massachusetts pay more). Slightly behind California is New York, where consumers pay 19.3 cents per kilowatt hour, thanks in part to a 50 percent REM. By contrast, Arizonans currently pay just a little more than the national average, which is 13.1 cents per kilowatt hour, according to the EIA. This means if Arizona's energy bills rose to the level of California's, Arizonans would pay almost 50 percent more each month in utility bills.

States with High Residential Energy Costs— Is Arizona Next?



What's more, since 2011, the price of energy in California has risen at *five times* the rate of increases in the rest of the country, according to the Berkeley-based think tank Environmental Progress.⁸ The cause of the increase? "Since the power crisis of the early 2000s settled down, the dominant policy driver in the electricity sector has unquestionably been a focus on developing renewable sources of electricity generation," said James Bushnell, an economics professor at the University of California, Davis.⁹ One study found that in 2016, California's rate for commercial customers was about 45 percent more than the national average, and the state's industrial customers paid nearly 73 percent more than the national average.¹⁰ Florida is at the other end of the energy spectrum. It does not have a clean energy mandate, and it uses natural gas, solar energy, clean coal, and nuclear power. Its utility costs have fallen by 3 percent since 2011.¹¹ Does Arizona want to pay rates more like those of affordable Florida, or costly California?

The evidence from other states throughout the country is clear: Renewable mandates drive up electric power costs.

Why Do REMs Drive Up Prices?

One major reason for the higher costs in REM states is that the mandate often precludes utilities from buying the cheapest energy source. For example, even in circumstances where natural gas or coal prices are very low, if the utility has not met its REM requirement, it will have to purchase more expensive wind or solar power to comply with the mandate.

The other lesson from the failed experiment with renewable energy mandates is that politicians and regulators and activists cannot know in advance what the most affordable energy supply will be two or five or certainly 10 years down the line. A recent case in point has been the dramatic and entirely unexpected reduction in natural gas prices from more than \$10 per million cubic feet to about \$3 today.12 This 70 percent reduction in domestic natural gas prices has made the fuel much cheaper than virtually any other source of electric power-and more cost-efficient than wind and solar power in many states. Today, wind and solar power require federal taxpayer subsidies that range between 5 and 60 times higher than any subsidy provided for natural gas or coal. (Remember: Federal tax law gives a 30 percent tax credit for all energy produced from wind and solar, a cost borne by taxpayers. Almost no other industry in America receives that advantage.)

Moreover, energy experts and regulators largely failed to anticipate the reduction in natural gas prices due to drilling breakthroughs in 2006 that gave producers massive access to shale gas from North Dakota to West Virginia. The era of \$3 natural gas was a game changer for the energy industry. States without REMs were able to react instantly to the windfall benefit of lower rates passed on to their customers. One lesson here is that locking a state into one form of energy production over another can have unintended harmful consequences to utility costs given the dynamic nature of the energy sector.

Who Will Bear the Cost of Higher Energy Prices in Arizona?

What will these higher energy costs mean for typical Arizona businesses and families?

A recent analysis conducted by Arizona State University's Seidman Institute projects that if the initiative passes, the average price of electricity by 2030 for residential customers will increase 117 percent relative to the 2017 price. That translates to the *average* residential customer bill rising by more than \$1,900.¹³ Another study, by the Arizona Residential Utility Consumer Office, which is the state's ratepayer advocate, found that by 2030, energy prices would increase by \$449 per year for some customers, and \$630 for others.¹⁴

The renewable energy mandate will also depress tax revenues—hampering the ability to fund schools, infrastructure improvements, and public safety. The Seidman Institute also projects that if the initiative passes, state and local governments will see their tax revenues decline by nearly \$3 billion between 2018 through 2060. Property taxes would also plunge by \$859 million—with about half of that loss (\$435 million) shouldered by local school districts.¹⁵ These are high costs to education and could come out of teacher pay raises.

Some proponents of Prop. 127 argue plausibly that higher energy costs are worthwhile in exchange for clean power and cleaner air. But these advocates typically ignore that energy costs are deeply regressive hitting those with low incomes the hardest and eating up almost seven times more of their income than the income of wealthier families, according to the Census Bureau. So a millionaire or billionaire will pay a tiny fraction of about one percent of their income in energy costs, while a poor household could pay 10 percent.

Energy Restrictions Hurt the Poor



It's a painful irony that the most vocal advocates for renewable energy mandates, and those who are primary funders of measures like the one in Arizona, are often billionaire plutocrats such as Tom Steyer (who does not even live in Arizona). Energy mandates are a 21st century reversal of Robin Hood: stealing from the poor to subsidize the rich.

Prop. 127 Won't Improve the Environment

One critical flaw of the initiative as drafted is that it squeezes out two of the most dominant and cleanest forms of energy used in Arizona. These are natural gas and nuclear power. Green energy for purposes of the initiative include wind and solar power primarily, *excluding* nuclear and natural gas. But from an environmental and clean air standpoint and for the purposes of reducing greenhouse gases that may be linked to climate change, this distinction makes no sense. It appears simply to be a multibillion-dollar corporate welfare giveaway to the solar and wind industries at the expense of ratepayers.

Start with natural gas. Nearly every study has shown

that America's increased reliance on natural gas as a domestic utility is the main reason we've reduced our carbon and greenhouse gas emissions more than virtually any other industrialized nation over the last decade—and far more than major global polluters China and India.¹⁶ Natural gas now supplies well over one-third of our electric power, and that percentage is expected to rise steadily over the next decade.¹⁷ Natural gas has the advantage of being cheap-the price has fallen from \$10 to \$3 per million cubic feet in a decade, thanks to the shale gas production explosion; it is reliable, and it is clean-burning.¹⁸ There is no logical environmental reason for Arizona to use less natural gas. If the state does use less, Arizona homeowners and businesses may pay more for energy than their counterparts in other states-unless the cost of solar power production and storage falls dramatically.

Even safer is nuclear power, which releases virtually zero emissions into the atmosphere. It is by far the most effective way of reducing greenhouse gas emissions. It is by far the most affordable way to reduce ozone, lead, carbon monoxide, and smog.¹⁹ A "cleaner air" energy policy that excludes nuclear energy production is nonsensical, especially since Arizona is already home to one of the most cost-effective nuclear plants in operation—the Palo Verde plant. Nuclear waste is, of course, an environmental issue, but one that is easily solved in a vast state like Arizona.

Even coal that is burned in Arizona is much cleaner today than it was 10, 20, or 30 years ago. All of this is evidenced by the dramatic improvement in air quality nationally over the past 35 years. Only a small percentage of this progress is due to renewable energy, because over most of this period, wind and solar have been fairly inconsequential sources of U.S. energy production.²⁰ Since 1980, total emissions of the six principal air pollutants has fallen by 67 percent (see the chart below). To put that in perspective, this decline occurred amid a dramatic expansion of the U.S. economy. Gross domestic product increased 165 percent, vehicle miles traveled increased 110 percent, the U.S. population grew by 44 percent, and energy consumption increased 25 percent.²¹ The net effect has been a remarkable improvement in air quality throughout the United States.



Air quality has also been improving in Arizona. Since 1990, the state's population has increased 82 percent. More people mean more emissions. Yet during this period, air pollution in Arizona has declined 62 percent.²² Arizona Department of Environmental Quality division director Tim Franquist told KTAR News earlier this year, "Despite the fact that the population is increasing, the vehicles miles traveled per year is increasing, even our economy is growing and, with all that, we're actually seeing improvements in air quality over time."²³

This is why Prop. 127 will have almost no impact on air quality or greenhouse gas emissions in Arizona. The chart below shows that Arizona currently gets well more than 50 percent of its energy from "clean sources." Already 51 percent comes from nuclear and natural gas, which are green energy sources.

Moreover, a clean energy future is already in the cards

for Arizona without Prop. 127. By 2032—about the time the full REM would kick in—50 percent of the energy generation in Arizona would come from nuclear and natural gas, renewable energy would rise from 12 to 18 percent (without any government mandates), and coal use would be cut almost in half. The only way to get to 50 percent wind and solar power would be to sharply reduce nuclear and natural gas usage. The major effect of Prop. 127 would be to require Arizona utilities to use less nuclear and natural gas and more wind and solar—even though nuclear and natural gas are expected to continue to be much cheaper to produce. If that dynamic shifts and solar power becomes more affordable, as proponents of the initiative are betting will happen, Prop. 127 is unnecessary because the composition of energy toward solar will happen through market competitive forces—the same market forces that dramatically increased natural gas use in the wake of its lower prices.



Arizona's Energy Is Clean

This conclusion of minor environmental gains has been confirmed by National Economic Research Associates, a venerable economic consulting and analytics firm. Its analysis finds:

The Initiative cannot be expected to improve reported levels of ozone pollution in areas where most Arizonans live because it targets power plant emissions that, in total, already have very little impact on the Phoenix area's ozone levels (based on the average over all high ozone days), and which the Initiative would reduce by only a miniscule amount.²⁴

The Environmental Protection Agency has reached a similar conclusion regarding state mandates. In 2014 during the Obama administration, the agency studied the impact of a reduction in emissions by Arizona electric generators that would have been *larger* than the initiative calls for. The EPA's conclusion? By 2025, there would be *no change* in the ozone design values at any of the 28 monitors in the counties of Maricopa and Pinal.²⁵

Renewable energy advocates tend to overlook the many factors contributing to air quality. The major factor is cars, and those are not affected by Prop. 127. Other factors are often beyond the reach of government regulation and beyond a state's borders. Air quality can, for example, be influenced by naturally occurring phenomena such as wildfires. It can also be influenced by emissions from other states or even another country, Mexico. A study by the Arizona Chamber Foundation reveals that on days when Arizona's air quality is deemed to be "high ozone," roughly two-thirds of the ozone in the Phoenix area can be traced to other areas or naturally occurring phenomena.²⁶ The renewable energy mandate would do nothing about this.

Will Prop. 127 Create Jobs?

Advocates of Prop. 127 at the NRDC estimate billions of dollars of additional investment in the state and 15,000 more jobs from solar power installations. But these are billions of dollars that in most cases will be paid by Arizona families and businesses to build an energy infrastructure that already exists in Arizona. Gas pipelines exist. The Palo Verde nuclear plant has already been in operation for decades. Hence, the jobs the NRDC says will be "created" from Prop. 127 will be to build out an energy infrastructure that would be offset by tearing down existing clean energy infrastructure that already employs hundreds of people. Coal plants and nuclear capacity would be greatly diminished.

What the NRDC study also ignores is the large cost to the Arizona economy from Prop. 127. If prices rise anywhere near the 40 to 50 percent range common in other states and especially in California, then families will have less money to spend on other purchases in Arizona—housing, school supplies, school tuition, cars, health insurance, trips to the mall, groceries, etc. Making Arizonans poorer is a bad way to try to make the state richer.

But the most worrisome negative economic effect of the initiative will be to make Arizona a less competitive state for businesses. Higher energy costs will move businesses—especially technology, and manufacturing firms—out of the state. Florida will have energy costs that may be as little as half that charged in Arizona. This will lead to what economists call a "leakage" of economic activity outside of the state. The loss of jobs from a 40 to 50 percent rise in energy prices could easily lead to the loss of 10 times the jobs gained from building and installing solar panels. In Germany, Australia, and many other countries where fossil fuels and nuclear power were replaced with expensive renewable energy, the effect was a "deindustrialization," and such plans were soon scuttled to make those nations more cost-competitive again. Arizonans need only look to the west to see what has happened in California, where similar measures hollowed out the state's middle class.

<u>Conclusion: All Pain and</u> <u>No Gain</u>

This study warns that energy costs in Arizona could rise by as much as 40 to 50 percent in Arizona if Prop. 127 is enacted and the state is mandated to move to 50 percent green energy by 2030. This has been the almost universal experience of other states. Arizona has a healthy solar industry and is perhaps better poised than any other state in the nation to harness the power of the sun.

Even if groups like the NRDC and billionaires like Tom Steyer are correct that solar prices will fall substantially over the next decade, this would not make the case for passage of Prop. 127. In this case, the energy market will move Arizona toward greater reliance on solar energy—and that would certainly be a positive thing for the state.

But Prop. 127 gambles the entire state's economy on the future of wind and solar power. If that bet is wrong—as it has been in most states—the consequences for Arizona families and businesses could be disastrous, and it will be the poorest Arizonans who suffer most.

ENDNOTES

1 Howard Fischer, "Public health advocates campaign for Prop 127," *Arizona Capitol Times*, October 9, 2018, <u>https://azcapitoltimes.com/</u> <u>news/2018/10/09/public-health-advocates-campaign-</u> <u>for-prop-127/</u>; and Dylan Sullivan, "AZ's Prop 127 Would Create Thousands of Clean Energy Jobs," NRDC, September 24, 2018, <u>https://www.nrdc.org/</u> <u>experts/dylan-sullivan/azs-prop-127-would-create-</u> <u>thousands-clean-energy-jobs</u>.

2 Arizona Secretary of State: Arguments Submitted "Against" C-04-2018, Clean Energy for a Healthy Arizona Amendment, Kerry Ballard, Vice Mayor, Town of Snowflake; <u>https://azsos.gov/sites/default/</u> <u>files/Arguments%20Against%20-%20C-04-2018.pdf</u>.

3 Laurie Roberts, "APS has 488 million reasons to vote against Prop 127. I only have one," *Arizona Republic*, October 8, 2018, <u>https://www.azcentral.com/</u> story/opinion/op-ed/laurieroberts/2018/10/08/apsarizona-public-service-against-prop-127-should-wehelp/1570009002/; and Vanessa Barchfield, "Arizonans to Decide on the State's Energy Future in November," Arizona Public Media, September 10, 2018, <u>https://</u> <u>news.azpm.org/p/azelections/2018/9/10/136723-ari-</u> zonans-to-decide-on-the-states-energy-future-on-no-<u>vembers-ballot/</u>.

4 "Table 5.6.A. Average Price of Electricity to Ultimate Customers by End-Use Sector," Electric Power Monthly, U.S. Energy Information Administration, released August 24, 2018, <u>https://web.archive.org/</u> web/20180915155615/https:/www.eia.gov/electricity/ monthly/epm_table_grapher.php?t=epmt_5_6_a.

5 "State Renewable Portfolio Standards and Goals," National Conference of State Legislatures, July 20, 2018, <u>http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx</u>.

6 Arizona Secretary of State, *Application for Serial Number Initiative Petition A.R.S.* §19-111, https://apps.azsos.gov/election/2018/general/ballotmeasuretext/C-04-2018.pdf. 7 Robert Bryce, "The High Cost of Renewable-Electricity Mandates," Energy Policy & the Environment, (February 2012). <u>http://ieuohio.org/</u> <u>resources/1/Education%20Home%20Page/CEPE_Renewable_Report_0212.pdf</u>.

8 "Electricity prices in California rose three times more in 2017 than they did in the rest of the United States," Environmental Progress, February 12, 2018. <u>http://environmentalprogress.org/bignews/2018/2/12/electricity-prices-rose-three-timesmore-in-california-than-in-rest-of-us-in-2017</u>.

9 James Bushnell, "Breaking News! California Electricity Prices are High," Energy Institute at Haas (blog), February 21, 2017. <u>https://energyathaas.wordpress.com/2017/02/21/breaking-news-california-electricity-prices-are-high/</u>.

10 Robert Bryce, "Energy Policies and Electricity Prices: Cautionary Tales from the E.U.," Manhattan Institute, (March 2016), p. 14, <u>https://www.manhat-tan-institute.org/sites/default/files/R-RB-0316.pdf</u>.

11 "The Price Californians Will Pay," *Wall Street Journal*, September 12, 2018, <u>https://www.wsj.com/articles/californias-carbon-exorcism-1536707391</u>.

12 "Henry Hub Natural Gas Spot Price," United States Energy Information Administration, released October 3, 2018, <u>https://www.eia.gov/dnav/ng/hist/</u><u>rngwhhdm.htm</u>.

13 Seidman Research Institute, Arizona State University, *Estimated Increase in Residential Electric Rates Associated with* Clean Energy for a Healthy Arizona (50x30 Plan), <u>http://seidmaninstitute.com/</u> <u>wp-content/uploads/2018/09/Memorandum-080918.</u> <u>pdf.</u>

14 "Press Release – RUCO Releases Analysis of Rate-Related Ballot Initiative," Residential Utility Consumer Office, August 16, 2018, <u>https://ruco.</u> <u>az.gov/press-release-ruco-releases-analysis-rate-relat-</u> ed-ballot-initiative. 15 Seidman Research Institute, Arizona State University, *The Economic Impact of the Clean Energy for a Healthy Arizona Proposal on Arizona's Economy*, 2018-2060, <u>http://seidmaninstitute.com/wp-content/</u> <u>uploads/2018/04/APS-Summary-Report-0327.pdf</u>.

16 James Taylor, "Climate Group: Natural Gas, Not Renewables, Is Largest Factor In Emissions Decline," *Forbes*, September 12, 2017, <u>https://www.</u> forbes.com/sites/jamestaylor/2017/09/12/climategroup-natural-gas-not-renewables-is-largest-factor-inemissions-decline/#724043323658; Zeke Hausfather, "Analysis: Why US carbon emissions have fallen 14% since 2005," *Carbon Brief*, August 15, 2017, <u>https://</u> www.carbonbrief.org/analysis-why-us-carbon-emissions-have-fallen-14-since-2005; and Michael Goff, "How Natural Gas and Wind Decarbonize the Grid," *The Breakthrough*, July 13, 2017, <u>https://thebreakthrough.org/index.php/issues/decarbonization/hownatural-gas-and-wind-decarbonize-the-grid.</u>

17 "Table 1.1. Net Generation by Energy Source: Total (All Sectors), 2008-July 2018," Electric Power Monthly, United States Energy Information Administration, released September 25, 2018, <u>https://www.eia.</u> gov/electricity/monthly/epm_table_grapher.php?t=epmt_1_01; and "Short-Term Energy Outlook," United States Energy Information Administration, released October 10, 2018, <u>https://www.eia.gov/outlooks/steo/</u> report/natgas.php.

18 "Henry Hub Natural Gas Spot Price," United States Energy Information Administration, released October 3, 2018, <u>https://www.eia.gov/dnav/ng/hist/</u> <u>rngwhhdm.htm</u>.

19 David Biello, "How Nuclear Power Can Stop Global Warming," *Scientific American*, December 12, 2013, <u>https://www.scientificamerican.com/article/</u> <u>how-nuclear-power-can-stop-global-warming/;</u> "Air Quality," Nuclear Energy Institute, <u>https://www.nei.</u> <u>org/advantages/air-quality;</u> and "Greenhouse gas emissions avoided through use of nuclear energy," World Nuclear Association, <u>http://www.world-nuclear.org/</u> <u>nuclear-basics/greenhouse-gas-emissions-avoided.aspx.</u> 20 Institute for Energy Research, *Cleaned-Up Coal and Clean Air: Facts About Air Quality and Coal-Fired Power Plants*, <u>https://www.instituteforen-</u> ergyresearch.org/uncategorized/cleaned-coal-clean-air-<u>facts-air-quality-coal-fired-power-plants/</u>; and Mark J. Perry, "Inconvenient energy fact: It takes 79 solar workers to produce same amount of electric power as one coal worker," *AEIdeas*, May 3, 2017, <u>http://www. aei.org/publication/inconvenient-energy-fact-it-takes-</u> 79-solar-workers-to-produce-same-amount-of-electricpower-as-one-coal-worker/.

21 "Air Quality – National Summary," United States Environmental Protection Agency, <u>https://www.</u> <u>epa.gov/air-trends/air-quality-national-summary</u>.

22 Joe Gilmore, "Air quality across Arizona has improved despite population increase," *KTAR News*, April 19, 2018, <u>http://ktar.com/story/2027929/</u> <u>air-quality-arizona/</u>.

23 Ibid.

24 NERA Economic Consulting, prepared for Arizona Public Service, *Potential Impacts on Phoenix Area Ozone Air Quality from a Proposed Renewable Energy Ballot Initiative*, <u>http://votenoprop127.com/</u> <u>wp-content/uploads/Air-Quality.pdf</u>.

25 Regulations.gov, Air Quality State Implementation Plans; Approvals and Promulgations: Arizona, Phoenix-Mesa; 2008 Ozone Standard Requirements, https://www.regulations.gov/document?D=EPA_FR-DOC_0001-18175.

26 Arizona Chamber Foundation, A Clear and Present Danger: How the EPA's New Ozone Regulations Threaten Arizona's Economy, <u>http://www.azchamberfoundation.org/wp-content/uploads/2018/06/</u> <u>Ozone-Regulations-June-2016-1.pdf.</u>



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