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Informational Testimony on the Maryland Clean and Renewable Energy Standard, HB363/SB265

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This testimony will be followed by an issue brief to be published by Resources for the Future, once we have done more analysis. That issue brief will be available at rff.org/shawhan. My coauthor and I welcome information to improve our analysis and inquiries and discussion about our analysis. We can be reached at shawhan[at]rff.org and (202) 328-5027. I am a Marylander and a PhD economist with more than 20 years of experience analyzing electricity policies, especially environmental ones. I am a full-time fellow at Resources for the Future and a non-resident adjunct faculty member at Cornell University.

About Resources for the Future

The mission of Resources for the Future (RFF) is to improve environmental, energy, and natural resource decisions through impartial economic research. RFF is committed to being the most widely trusted source of research insights and policy solutions leading to a healthy environment and a thriving economy. RFF is a 501(c)(3) tax-exempt nonprofit organization that operates according to core values of independence and rigor, adhering to the highest scientific and professional standards. RFF.org has more information about Resources for the Future.

RFF researchers speak for themselves, not for the organization. RFF does not take institutional positions on public policies. Neither, for that matter, am I taking a position for or against CARES or any other current or proposed policy. My aim today is to offer information about our projections of the likely effects of some provisions of CARES.

The CARES provisions we are analyzing so far

Paul Picciano and I, both of RFF, recently began using the Engineering, Economic, and Environmental Electricity Simulation Tool (E4ST) to model and simulate the future with two provisions of CARES: a Maryland in-state Clean Energy requirement and the reduction in Maryland's tier 1 renewable energy requirement (which can be met with power from a broad, multi-state region). I will call these the "percentage provisions" in CARES. We also simulate the future without CARES, for comparison. Relative to Maryland's current laws (chiefly CEJA), the net effect of these two CARES provisions through 2030 is to leave Maryland's total clean and renewable energy percentage requirement unchanged in 2030, and to increase it annually thereafter by 2.5% of Maryland electricity sales, through 2040. These two provisions, together,

also shift some of Maryland's current requirement from being a regional renewable energy requirement to being an in-state Clean Energy requirement. The Clean Energy requirement can be met with renewables but also with new nuclear, carbon capturing, or combined-heat-and-power generators.

We are not currently representing two other provisions of CARES, which are to make large hydropower eligible, and waste-to-energy ineligible, for Maryland's tier 1 renewable energy requirement. We have not yet had time to investigate well the likely effects of these tier 1 eligibility changes. Our modeling results to date represent the effects of CARES *without* these tier 1 eligibility changes. Some of the findings I present below are unaffected by the fact that we are not modeling these tier 1 eligibility changes. Others are affected, and I will indicate which ones are affected. Also, these results are preliminary.

The simulation model we are using

E4ST is a highly realistic, detailed, model of the electric sector, grid, and market. It projects what generators will be built, what generators will retire, and how the system will operate, in successive future years, based on economics and on the physical characteristics of the grid and generators. E4ST.org contains more information about E4ST. We use medium projections of future fuel and generator construction costs, except in the high solar and wind cost scenario that I will mention.

Some projected effects of CARES

Assuming that new onshore wind cannot be permitted in Maryland, our model projects that the CARES in-state Clean Energy requirement, which increases to 30% of Maryland retail electricity sales by 2040, would be satisified with solar and a small amount of CHP, even in our high solar and wind cost scenario.[1] The other eligible technologies, chiefly new nuclear and new carbon capturing plants, are projected to be too expensive to compete with solar, even under our high solar and wind cost scenario.

There would be a partially offsetting reduction in clean and renewable generation outside of Maryland, partly because CARES reduces the Maryland tier 1 renewables requirement (which can be met within a multi-state region) and partly because the increased Maryland solar crowds out other generation, mostly solar, in other states. The net effect of the CARES percentage provisions on nationwide greenhouse gas emissions (in CO2-equivalent) is near zero as of 2030 and a reduction of 0 to 9 million tons per year as of 2040, in our simulation results. The effect varies according to factors such as the future cost of solar and wind generators and whether the Regional Greenhouse Gas Initiative's price ceiling or Emission Containment Reserve has been triggered. For comparison, we project that

[1] Our medium solar and wind cost scenario assumes that the cost per megawatt of new solar and wind generation facilities will decline according to the "mid" cost paths projected in NREL (2019). Our high solar and wind cost scenario assumes that they will decline only half that much.

Maryland's 2040 power sector emissions will be 9 million tons under current policies. I 2016, they were 36 million. Making large hydro eligible for Maryland tier 1 could further reduce renewable generation outside of Maryland, by supporting large hydro, which is less likely to need the support in order to keep operating, instead of other renewables such as new wind and solar. This could reduce or reverse the emission benefits of CARES.

Our model projects that the percentage provisions of CARES would hurt the profits of the Calvert Cliffs nuclear plant, in most scenarios by approximately $10 million in 2030 and 2040. This could tip it from profitability to unprofitability. The tier 1 eligibility provisions could affect this result, but I would not expect them to alter this result by much.

Our model projects that CARES would have little effect on in-state power plant emissions. Projected natural gas fired generation in Maryland equals about one sixth to one quarter of Maryland retail electricity sales in 2030 and 2040, and there is no coal fired generation, both with and without CARES. This is also true with the 100% renewables policy we simulated, which we describe below. The increase in Maryland solar generation offsets a mix of emitting and non-emitting generation outside of Maryland. Emitting generation can continue under CARES or the 100% RPS partly because some of the Maryland renewable energy requirement is met with unbundled renewable energy credits produced outside of Maryland. To make up the difference, Maryland imports electric energy, has generation that doesn't qualify for the policy, or both. Having natural gas fired generation on Maryland helps to balance the variability of the solar generators.

Effects of allowing other non-emitting generation types to satisfy the clean energy requirement, as CARES does, instead of just renewables

In order to make an apples-to-apples comparison between CARES and a 100% renewable energy policy, we simulate the kind of 100% renewables policy that is most similar to CARES: It is CARES, but with the CARES Maryland in-state Clean Energy requirement and the CARES Calvert Cliffs wedge both turned into a Maryland in-state renewables requirement.

If Calvert Cliffs were kept open under CARES (which is not certain), but it retired under this 100% renewables policy (which is far from certain), then emissions would be very similar under the two policies, according to our modeling. Generation would also be similar except that the Calvert Cliffs nuclear generation occurring under CARES would be replaced with more Maryland solar generation under this 100% renewables policy. However, Maryland retail electricity prices would be higher under the 100% renewables policy than under CARES. Approximately 0.5% higher in 2030 and 5% in 2040, in our high solar and wind cost scenario. We expect the difference to be less in our medium solar and wind cost scenario, once we simulate the 100% renewables policy in that scenario.

Of course, a 100% renewables policy *combined with* keeping the Calvert Cliffs nuclear plant open would reduce emissions more than CARES.

Again, we will release issue brief with more information once our analysis is done.

Work Cited

National Renewable Energy Lab (NREL) and Oak Ridge National Lab (ORNL). Vimmerstedt, L., Akar, S., Augustine, C., Beiter, P., Cole, W., Feldman, D., ... & Stehly, T. (2019). 2019 Annual Technology Baseline ATB Cost and Performance Data for Electricity Generation Technologies (No. 115). National Renewable Energy Lab, Golden, CO (United States); Oak Ridge National Lab

Author Background

Dr. Daniel Shawhan (shawhan@rff.org) is a Marylander, a Fellow at RFF in Washington DC, and an adjunct faculty member in the Dyson School of Applied Economics and Management at Cornell University. Dr. Shawhan has more than 20 years of experience in electricity policy research and market design. Much of Dr. Shawhan's research focuses on predicting and estimating the effects of national and state electricity policies, including environmental ones. Over the last thirteen years, he has played a leading role in developing a new set of capabilities for simulating how power grids, power plants, and pollution levels will respond to potential changes in policy. He also works on electricity market design and environmental policy design. He advised five US states on the successful restructuring of their electricity markets, and has also advised on the design of environmental policies. Dr. Shawhan has a PhD in Applied Economics and Management from Cornell University. He is a Marylander and is the original author of the Maryland renewable energy portfolio standard, introduced in 2000 by Senator Dorman, and adopted in modified form a few years later.