

December 1, 2014

RE: Comments of Arizona State University LightWorks' on the Environmental Protection Agency Proposed Rule – Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Generating Units Docket Number EPA-HQ-OAR-2013-0602

Arizona State University's (ASU) LightWorks initiative appreciates the opportunity to submit feedback on the EPA's 111(d) proposed regulations. ASU has participated in ADEQ's stakeholder meetings on 111(d) and we plan to stay engaged in their process going forward. We recently submitted the following comments to ADEQ; however, we believe they are also relevant for EPA's consideration of the proposed rule. We would be happy to answer any questions about the information contained herein.

Sincerely,



Gary Dirks
Director, LightWorks
Director, Julie Ann Wrigley Global Institute of Sustainability

Comments to the Arizona Department of Environmental Quality on the
Environmental Protection Agency's Clean Power Plan

ASU LightWorks appreciates the opportunity ADEQ has provided to submit feedback on the EPA's Clean Power Plan. Representatives from our group have attended the ADEQ stakeholder meetings and we commend ADEQ for hosting an open and transparent stakeholder process. The following comments address several issues that we urge ADEQ to consider both in its formal comments to EPA and through the development of its State Implementation Plan.

Summary of recommendations:

- 1. Building Block 1 should explicitly allow for technologies that reduce emissions at the Existing Generating Unit (EGU) besides heat rate improvements.*
- 2. Existing policies in Arizona are likely to contribute significantly towards Arizona's emissions reduction goal and surpass EPA's expectations for Building Blocks 3 and 4.*
- 3. The Arizona Department of Environmental Quality (ADEQ) should take advantage of the supporting role that Arizona's universities can play in developing its State Implementation Plan.*

Recommendations and explanation:

- 1. Building Block 1 should explicitly allow for technologies that reduce emissions at the Existing Generating Unit (EGU) besides heat rate improvements.*

The EPA's proposal suggests that the primary method for reducing emissions "inside the fence" (i.e. at the site of the EGU) under Building Block 1 would be heat rate improvements at coal-fired power plants. Unfortunately, this option is largely unavailable to Arizona if significant portions of its coal fleet are retired. However, we believe there may be other ways to reduce emissions inside the fence that should be considered under Building Block 1. More specifically, we believe that algae-based fuel production and other CO₂ recycling approaches holds great promise for capturing carbon emissions at fossil-fuel power plants, thereby reducing the overall emissions rate.¹ Since these reductions have the potential to occur on the same site as an EGU, they might logically be considered as part of Building Block 1 under EPA's proposed framework as an "inside the fence" measure. While the EPA has suggested that states could implement additional emissions reduction measures beyond those explicitly outlined in the proposal, we urge ADEQ to request EPA's

¹ Although carbon emissions captured in this way are ultimately released to the atmosphere when the fuel product is burned, the production of biofuels, synthetic fuels, and other products would diminish the overall need for fossil fuel combustion elsewhere in the economy, thereby does lead to overall emissions reductions, which can be quantified.

clarification on this position and whether such measures might be considered under Building Block 1, or approved at all under a State Implementation Plan.

We believe Arizona is a prime location for using sunlight in CO2 recycling technologies creating an industry that can flourish and could benefit greatly from using it as an option for meeting compliance.² For example, ASU is home to the Arizona Center for Algae Technology and Innovation (AzCATI), which serves as a national test bed for research, testing, and commercialization of algae-based products such as biofuels, pharmaceuticals, nutraceuticals, waste water treatment, and other algae co-products. From the time of its inception in 2010 with a grant from Science Foundation Arizona, AzCATI has grown a research funding portfolio of more than \$22 million. AzCATI currently leads several sponsored projects, including Salt River Project's microalgae carbon capture at Navajo Generating Station. We believe algae based capture of CO2 emissions could be expanded to other EGUs in the state and across the country. Additionally, ASU's experience at AzCATI has produced a wealth of data and practices that will enable precise measurement of carbon emissions captured at a facility.

Finally, as a general principle, we believe the EPA could be more explicit about the role that future technologies might play in achieving emissions reductions. By explicitly allowing algae-based and other carbon capture and utilization technologies as a means for achieving Block 1 emissions reductions, EPA will be embracing the necessary role of emerging technologies in achieving meaningful climate change mitigation and carbon management. This could also be achieved by giving states special consideration in approving their State Implementation Plans if they sufficiently support clean power R&D activities.

2. Existing policies in Arizona are likely to contribute significantly towards Arizona's emissions reduction goal and surpass EPA's expectations for Building Blocks 3 and 4.

Through our participation in ADEQ's stakeholder process and other forums, we have observed a great deal of concern over Building Block 2, including the notion that EPA may be overestimating reduction levels achievable for Arizona. However, ASU has also conducted some analysis suggesting that EPA may in fact be *underestimating* what is achievable for Building Blocks 3 and 4 under existing policies. This could offset a large portion of the need to re-dispatch under Building Block 2. Drawing from data reported by the state's utilities, we believe that Arizona is on pace to significantly exceed the amount of renewable energy contemplated in the proposal under Building Block 3. This provides some flexibility within Arizona's other Building Blocks.

² In a recent letter encouraging Algenol Biofuels to select Arizona as the location for a new commercial facility, Arizona's Congressional Representatives Gosar, Franks, Salmon, Barber, Pastor, Sinema, and Kirkpatrick noted that Arizona's natural conditions provide advantageous conditions for biofuel development. The letter can be read here:

<http://gosar.house.gov/sites/gosar.house.gov/files/8.27.14%20AZ%20Delegation%20Algenol%20Biofuels%20invite.pdf>

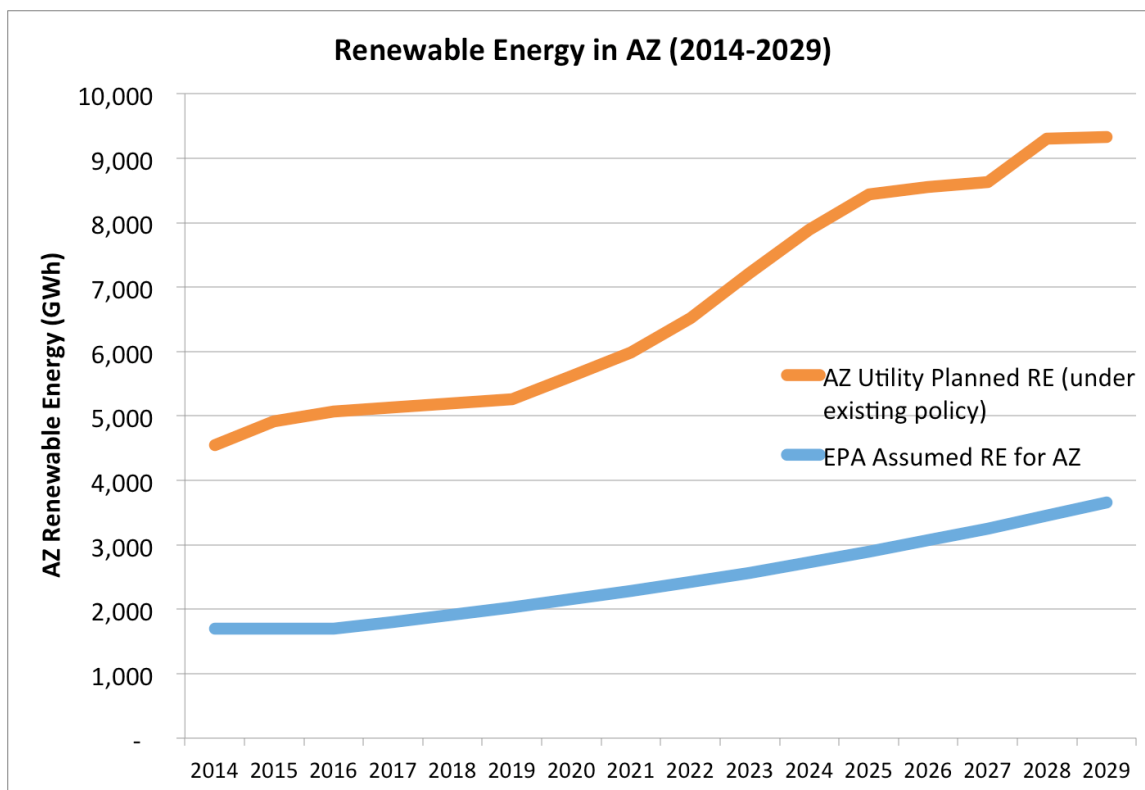


Figure 1. Data sources: 1) EPA Assumed RE for AZ from *EPA Clean Power Plan Proposed Rule Technical Documents, Goal Computation – Appendix 1 and 2*, accessed from http://www2.epa.gov/sites/production/files/2014-06/20140602tsd-state-goal-data-computation_1.xlsx; 2) AZ Utility Planned RE (under existing policy) from *APS 2014 Integrated Resource Plan*, accessed from <http://images.edocket.azcc.gov/docketpdf/0000152210.pdf>, *TEP 2014 Integrated Resource Plan*, accessed from <http://images.edocket.azcc.gov/docketpdf/0000152206.pdf>, and *Salt River Project 2013 Sustainability Portfolio Progress Report*, accessed from http://www.srpnet.com/about/financial/2013AnnualReport/pdfx/FY13_SPP_Annual_Report_Final.pdf.

Additionally, for Building Block 4, the data suggest that Arizona utilities will exceed the EPA’s anticipated amount of energy savings in the early years. However, because the energy savings required by our current state policies level off after 2020, Arizona may underperform after 2022, unless policy changes are made.

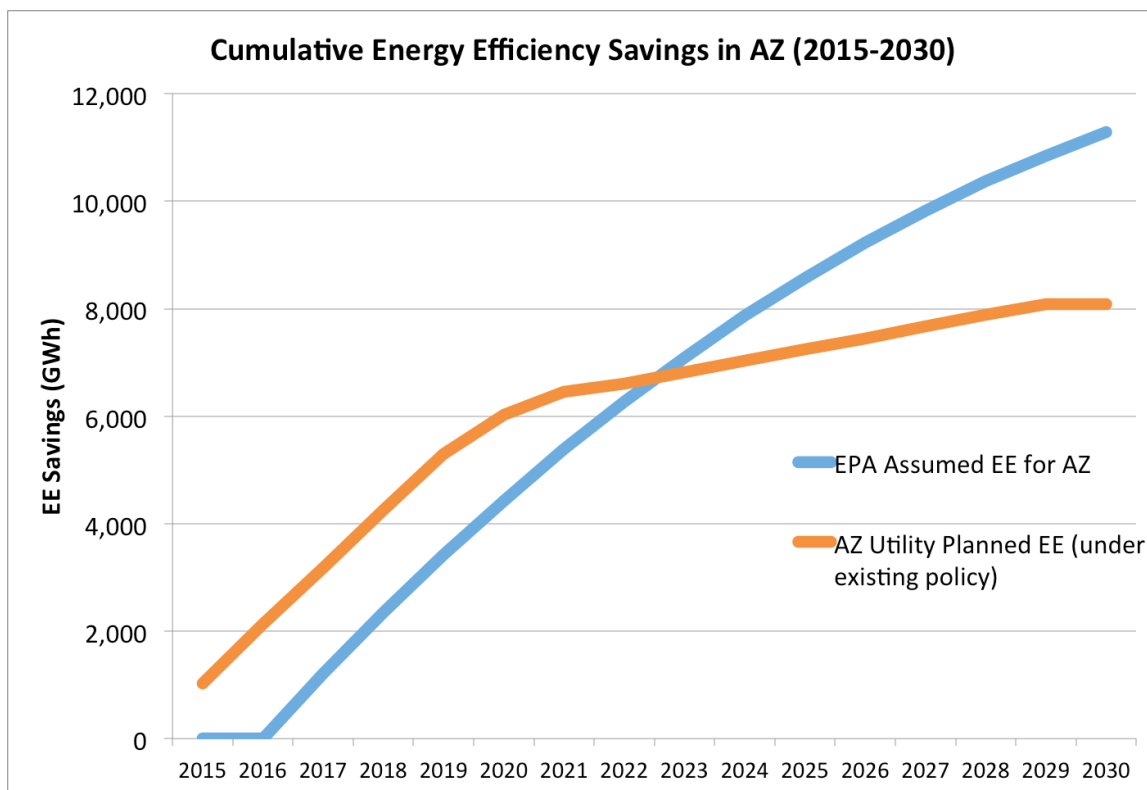


Figure 2. Data sources: 1) EPA Assumed RE for AZ from *EPA Clean Power Plan Proposed Rule Technical Documents, GHG Abatement Measures – Appendix 5-4*, accessed from <http://www2.epa.gov/sites/production/files/2014-06/20140602tsd-ghg-abatement-measures-appendix5-4.xlsx>; 2) AZ Utility Planned EE (under existing policy) from *APS 2014 Integrated Resource Plan*, accessed from <http://images.edocket.azcc.gov/docketpdf/0000152210.pdf>, *TEP 2014 Integrated Resource Plan*, accessed from <http://images.edocket.azcc.gov/docketpdf/0000152206.pdf>, and *Salt River Project 2013 Energy-Efficiency Report*, accessed from http://www.srpnet.com/about/financial/2013AnnualReport/pdf/EE_Report-web.pdf.

Taken together, Arizona’s existing policies appear sufficient to achieve roughly half of the EPA’s proposed goal through Building Blocks 3 and 4.

AZ Existing Policies

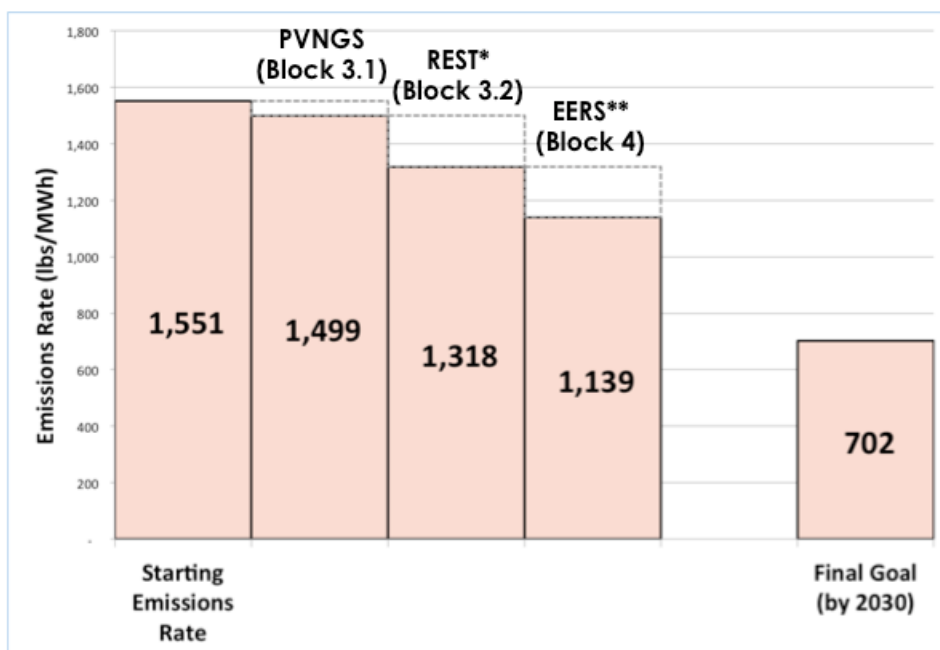


Figure 3. The chart above shows an estimate of the emissions rate reductions from three existing policies: 1) continued operation of Palo Verde Nuclear Generating Station (PVNGS), 2) achievement of the renewable energy targets set by the Arizona Corporation Commission in the Renewable Energy Standard and Tariff (REST) and 3) achievement of the energy efficiency targets set forth by the Energy Efficiency Resource Standard (EERS) and SRP's Sustainable Portfolio Principles. For simplicity we assume the REST only applies to APS and TEP and that SRP's goals achieves EE savings that match the EERS.

As ADEQ begins to consider the development of its State Implementation Plan, we urge the agency to conduct a robust scenario analysis that considers all the available options. For example, our preliminary analysis suggests that the EPA's final and interim goals could actually be met without retiring a significant portion of Arizona's coal fleet, provided that sufficient amounts of Building Blocks 3 and 4 are included. ADEQ should evaluate different combinations of each Building Block, as well as other measures – to determine the optimal outcome for the state. ASU is assembling a group of faculty and students that could assist in this scenario analysis.

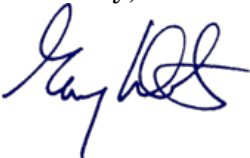
- ADEQ should take advantage of the supporting role that Arizona's universities can play in developing its State Implementation Plan.*

ASU recently launched a new initiative to engage faculty and students on issues related to the EPA's Clean Power Plan. As part of this overall effort, we plan to stay engaged with ADEQ's process and offer our assistance in the development of its State Implementation Plan. Recently we also met with faculty from University of Arizona and Northern Arizona University. Both universities are undertaking similar initiatives and will be coordinating their efforts with us. We believe that Arizona's universities have capabilities in a number of subject areas helpful to ADEQ's planning process. A partial list of the capabilities at ASU include:

- *Power systems analysis*: This could include the study of power system reliability and operations under conditions with higher penetrations of renewable energy and reductions in coal-fired generation.
- *Scenario planning*: ASU is home to many experts with experience conducting rigorous scenario planning exercises. We have conducted long-term planning exercises for a national coalition of electric utilities, as well as for other stakeholder groups such as the state's water resource managers. In the past, these sessions have been aided through the use of tools at such as the Decision Theater, which offers a space with real-time modeling capabilities to convene stakeholders for discussing and analyzing policy options.
- *Sustainable Cities Network*: ASU regularly convenes a network of professionals from the state's cities and towns to share best practices. This could be a forum for discussing what measures local jurisdictions can take to contribute to Building Block 4 (such as codes and standards).
- *Socio-economic analysis*: ASU has several economists who have a strong understanding of the energy industry and have conducted economic analyses of policy proposals related to the power sector.
- *Geographical Information Sciences*: ASU, especially the School of Geographical Sciences and Urban Planning, holds strong capabilities in GIS and spatial econometrics, including through its GeoDa Center.
- *Legal and policy analysis*: The Sandra Day O'Connor College of Law has specialists in the areas of administrative law, utility law and climate change. Additionally it is home to the Energy Policy Innovation Council – a policy research group that is heavily engaged in Arizona's energy policy landscape.
- *Assessment of emerging technologies*: Our research on promising technologies such as artificial photosynthesis and algae as biofuels and carbon capture mechanisms can provide long-term compliance and market opportunities.

ASU LightWorks appreciates the effort ADEQ has made to date on this issue and we look forward to working together with the agency and other stakeholders do develop a State Implementation Plan that is well informed and maximizes benefits to the state of Arizona.

Sincerely,



Gary Dirks
Director, LightWorks
Director, Julie Ann Wrigley Global Institute of Sustainability