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**BEFORE THE ARIZONA POWER PL...
AND TRANSMISSION LINE SITING COMMITTEE**

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IN THE MATTER OF THE APPLICATION OF ARIZONA PUBLIC SERVICE COMPANY, IN CONFORMANCE WITH THE REQUIREMENTS OF ARIZONA REVISED STATUTES 40-360 ET SEQ., FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AUTHORIZING THE OCOTILLO MODERNIZATION PROJECT, WHICH INCLUDES THE INSTALLATION OF FIVE 102 MW GAS TURBINES AND THE CONSTRUCTION OF TWO 230-KILOVOLT GENERATION INTERCONNECTIONS AND OTHER ANCILLARY FACILITIES, ALL LOCATED WITHIN THE BOUNDS OF THE EXISTING OCOTILLO POWER PLANT SITUATED ON PROPERTY OWNED BY ARIZONA PUBLIC SERVICE COMPANY AND LOCATED AT 1500 EAST UNIVERSITY DRIVE, TEMPE, ARIZONA, IN MARICOPA COUNTY.

Docket No. L-00000D-14-0292-00169

Case No. 169

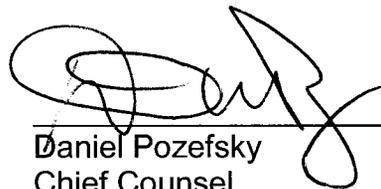
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RUCO'S NOTICE OF FILING

The Residential Utility Consumer Office ("RUCO") hereby provides notice of filing the testimony of Riley G. Rhorer, and the Witness Summary of Lon Huber, in the above-referenced matter.

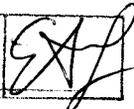
RESPECTFULLY SUBMITTED this 12th day of September, 2014.


Daniel Pozefsky
Chief Counsel

Arizona Corporation Commission

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SEP 12 2014

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1 AN ORIGINAL AND TWENTY-FIVE
2 COPIES of the foregoing filed this
3 12th day of September, 2014 with:

3 Docket Control
4 Arizona Corporation Commission
5 1200 West Washington
6 Phoenix, Arizona 85007

5 COPIES of the foregoing hand delivered/
6 mailed this 12th day of September, 2014 to:

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Summary Testimony RUCO witness Mr. Lon Huber

I plan to provide an overview of RUCO's approach to resource planning and the policy implications associated with such an approach. My testimony will touch on how RUCO views the changing electric utility landscape and the opportunities and risks consumers may face in the years ahead. It will conclude with a discussion on the proposed Ocotillo Modernization Project.

I will begin my testimony with a high level discussion on the following subjects:

- Emerging energy technologies
- System adaptability
- Consumer choice and empowerment
- Stranded costs

Following the above overview, I plan to comment on assumptions that may become more significant in current and future resource planning decisions than in years past. These include:

- Load growth projections
- Proper cost comparisons
- Projections around technology development and cost
- Consumer participation

Next, I will touch on the policy implications of RUCO's approach to resource planning in the changing utility environment. Topics will be:

- Resource procurement strategies
- Risk mitigation strategies

Finally, I plan to discuss why the proposed Ocotillo Modernization Project may not be the optimal choice for ratepayers given the above views on resource planning in a changing electric utility landscape.

I may supplement my oral testimony with a PowerPoint presentation.

DIRECT TESTIMONY OF

RILEY RHORER

RELATING TO APS' PROPOSED OCOTILLO MODERNIZATION PROJECT

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Riley Rhorer. My business address is 160 N. Pasadena, Suite101, Mesa, Arizona 85201.

Q. WHAT IS YOUR OCCUPATION AND BY WHOM ARE YOU EMPLOYED?

A. I am an electric utility consultant with the firm of K. R. Saline & Associates, PLC.

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND GENERAL PROFESSIONAL ENGINEERING EXPERIENCE.

A. I graduated from Texas A&M University in May 1969, receiving a Bachelor of Science Degree in Electrical Engineering. I am a registered professional engineer in the states of California and Arizona. I have 42 years of experience in the electric utility industry, including 30 years as a consultant.

Q. PLEASE STATE YOUR EXPERIENCE IN POWER SUPPLY AND ELECTRIC TRANSMISSION.

A. I have worked as an employee of two utilities, the Los Angeles Department of Water and Power ("LADWP") and the Public Utilities Board of Brownsville, Texas

("BPUB"). At the LADWP, I was employed as a transmission engineer and planner. The LADWP transmission system includes extensive AC and DC transmission facilities. My experience as a transmission engineer included transmission design work, as well as responsibility for planning transmission systems improvements.

Following my years as a transmission engineer, I joined a newly formed planning group whose special purpose was to study power pooling and various power interchange arrangements between interconnected utilities and to initiate and provide support for the LADWP's contractual arrangements for power interchanges with other utilities. While in this group, I evaluated power purchase and sales opportunities for LADWP, as well as opportunities to jointly participate in generating projects remote from the LADWP's service area.

At BPUB, I served as Director of Engineering and Planning, where my duties included management and supervision of all planning and engineering activities related to BPUB's electric power and water supply, transmission and distribution facilities, and its wastewater collection and treatment facilities. I also had management responsibilities for the power plant, and I represented BPUB in its participation in various committee meetings of the Electric Reliability Council of Texas ("ERCOT").

As a consultant, I have performed engineering services for clients in the states of Texas, New Mexico, Louisiana, Oklahoma, Missouri, Kansas, Utah, Colorado, South Dakota, Arizona, California and Florida. These services have included a variety of economic analyses, planning studies, contract analyses, power

supply recommendations and negotiations related to power supply and transmission arrangements.

I have presented testimony before the Federal Energy Regulatory Commission, the Public Utilities Commission of Texas ("PUCT"), the New Mexico Public Utilities Commission and the California Energy Resources Conservation and Development Commission.

In 2007, I presented testimony before the PUCT on the establishment of Competitive Renewable Energy Zones ("CREZs"). My testimony was provided on behalf of several large wind developers and included recommendations and support for transmission solutions that would enable my clients to development specific CREZs.

Q. ON WHOSE BEHALF ARE YOU APPEARING?

A. I am appearing on behalf of the Residential Utility Consumers Office ("RUCO").

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to highlight concerns with the power supply planning upon which Arizona Public Service ("APS") has relied to identify and evaluate alternatives to the proposed Ocotillo Modernization Project and to recommend what APS should do to address those concerns. Until these concerns are addressed and the need for the additional 290 MW clearly established as well as all alternatives exhausted RUCO cannot recommend anything beyond replacing the 220 MW steam turbines.

Q. WHAT DO YOU MEAN BY ADDRESSING THESE CONCERNS?

A. I mean APS needs to do more than explain away resource options such as energy storage and to do more than just screen out unit options such as the Wartsila 18V50 because it does not meet a questionable size requirement or because APS has failed to consider important beneficial characteristics of competing options while ignoring detrimental characteristics of the selected LMS100s.

Q. HAVE YOU PERFORMED ANY ANALYSES IN SUPPORT OF YOUR TESTIMONY?

A. While I have performed some high-level calculations, using the tabulated data from APS presentation materials, I have not performed any independent analyses, sufficient to recommend alternatives to the Ocotillo Modernization Project. The compressed time-line for reviewing the APS presentation materials and preparing pre-filed testimony has precluded my doing more than making some general observations and recommending areas that deserve further analysis by APS. To illustrate the limitations, we just received a bulk of data requests back from APS on the 10th of September. In any regard, my review of the APS presentation materials has led me to conclude that APS has not (or at least has not shown that it has) evaluated certain alternatives to the Ocotillo Modernization Project.

Q. WHAT APS PRESENTATION MATERIALS DID YOU REVIEW IN SUPPORT OF YOUR TESTIMONY?

A. For my testimony, I reviewed portions of the following documents:

- APS Ocotillo Modernization Project Ten Year Plan Filing, Ocotillo Modernization Project Load Flow, Transient Stability, Post-Transient, Short Circuit, and MLSC Analysis, April 2014
- APS 2014 IRP, April 2014
- APS 2012 IRP, March 2012
- APS Ocotillo Modernization Project Reliability, Location, Technology Technical Review Packet, July 2014
- APS Combustion Turbine Expansion Plan, March 2012
- APS Ocotillo CT 3-7 Expansion Study
- APS' presentation, entitled "Ocotillo Expansion Technology Selection for Peaking Service Duty"
- Revised Attachment D.3 of APS 2014 IRP
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Q. COULD YOU PROVIDE A BRIEF DESCRIPTION OF THE POWER SUPPLY PLANNING PROCESS?

A. In its most basic form, power supply planning involves the identification of power supply needs and the evaluation of the various means to satisfy those needs with the goal of developing a resource plan that is estimated to provide maximum benefit to APS' ratepayers. Because most of the resource options available to APS require lead times, the resource plan must identify power supply needs for future years. The resource plan also should take into account APS' interaction with the market on behalf of its ratepayers.

Q. DO YOU HAVE CONCERNS WITH THE WAY APS HAS IDENTIFIED ITS POWER SUPPLY NEEDS?

A. Yes. In its 2012 IRP, APS projected its total peak load requirements in 2014 to be 8,644 MW, whereas the 2014 IRP projects 2014 total peak load to be only 8,124 MW.^{1,2} Moreover, taking into account additional emphasis on Energy Efficiency (“EE”) Standards and distributed generation (“DG”) programs, APS’ forecasted growth rate of over 3% per year appears to be too high.³ APS has also identified 1,400 MW of expiring power purchase contracts.⁴ This magnitude of contract retirements will free a lot of capacity on the market and likely places APS in a good position to either renew such contracts or arrange new contracts under favorable conditions. APS should evaluate (which apparently has it has not done⁵) and present the potential for securing favorable purchase power contracts to replace those that are expiring. Finally, APS has asserted a number of resource-specific needs that require more scrutiny.

Q. COULD YOU PLEASE IDENTIFY AND DISCUSS THE RESOURCE-SPECIFIC NEEDS WITH WHICH YOU TAKE ISSUE?

A. The resource specific needs with which I take issue are enumerated and discussed below.

¹ APS 2012 IRP, Attachment F.1(a)

² APS 2014 IRP, Attachment F.1(a)(1)

³ The 3% growth rate is calculated from APS 2014 IRP, Attachment F.1(a)(1)

⁴ APS 2014 IRP, page XVI.

⁵ APS 2014 IRP at page 77. APS’ “plans to deploy a combination of market-based solutions, along with additional capacity at Ocotillo” is not a substitute for assessing the potential of securing favorable purchase power contracts.

- (1) First, APS has focused its evaluations on resources that can be added within the Phoenix Valley Load Pocket (“PVL P”). I believe that this should be considered as a positive factor in evaluating resource options, not as a “need” that precludes consideration of resource options outside the PVL P. It is my understanding that:
- (i) the currently planned transmission system, provides adequate import capability in the form of maximum load serving capability (“MLSC”) well into the future;⁶
 - (ii) APS and others have plans to improve future transmission import capability;
 - (iii) the additional MWs of the Ocotillo Modernization Project apparently reduces the MLSC in 2023;⁷ and
 - (iv) voltage support, if needed, can be provided by other means such as converting one or more retiring Ocotillo units to synchronous generator duty or adding a quick-response variable voltage device.
- (2) Another “need” that APS has asserted is that construction of all five proposed LMS100’s must be completed in a relatively short period of time (by summer 2018) because the costs increase dramatically if the schedule of the last three units is delayed either for 18 months or three years.⁸ Again, I believe that this construction requirements should not be evaluated as a “need’ but, rather, as a negative factor in evaluating resource options. APS should evaluate the estimated capital costs of delaying other resource options in a similar manner, including in this evaluation such options as the Wartsila unit listed in Table 1, page 2 of the Technical Review

⁶ The Phoenix Valley is a constrained area meaning there is not enough transmission capacity to bring in all of the load requirements, thereby requiring some generation to operate. The MLSC is the maximum amount of load that can be served in a constrained area with the highest combined use of transmission imports and generation is utilized.

⁷ See APS – Ocotillo Modernization Project Ten Year Plan Filing, , Exhibit B “Ocotillo Modernization Project Load Flow, Transient Stability, Post-Transient, Short Circuit, and MLSC Analysis”, page 20, Table 15, filed in Docket No. IE-00000D-13-0002, linked at <http://images.edocket.azcc.gov/docketpdf/0000153362.pdf>

⁸ See Ocotillo Modernization Project Reliability, Location, Technology Technical Review Packet (“Technical Review Packet”), dated July 2014, at page 13.

Packet. Moreover, while APS has evaluated the costs of construction delays, it is not evident that APS has evaluated the benefits to ratepayers of delaying the construction of the last three units or, for that matter, the entire Ocotillo Modernization Project. These potential benefits could include cost savings from delaying construction until APS could more fully utilize the entire amount of capacity being constructed. This is critical information that should be considered before approving a six to seven hundred million dollar project.

(3) APS identifies over-generation as a concern or “need” that the proposed Ocotillo Modernization Project will supposedly help to address.⁹ This problem generally occurs when loads are low, renewable generation output is high and thermal generation (needed for system stability) is at a minimum. Although the LMS100 units can be turned off, re-started and ramp quickly, their role appears to be one of staying off-line until the over-generation condition is corrected by increased loads. System stability during such periods requires on-line resources that are contributing to system inertia that can react in seconds not minutes. Consequently, assuming the LMS100s are operated in the start/stop mode suggested by APS, they will not mitigate the over-generation condition; they will simply not exacerbate it. Moreover, APS asserts that “highly flexible generation [is] needed to facilitate market purchases” during low load periods where Palo Verde market prices are low and may even be negative during non-summer periods.¹⁰ I believe this is misleading since APS may have little ability to purchase when loads are as low as

⁹ *Id.* at page 6 and 7.

¹⁰ *Id.* At page 6.

APS has indicated they may be.¹¹ APS should fairly and fully evaluate energy storage resource options that actually mitigate the over-generation condition and, in fact, do facilitate market purchases when prices are low or even negative.¹² Energy storage would add load when it is most needed, reduce the ramping requirement and improve the efficiency of thermal units that are otherwise operated at their minimum levels. Assuming the types of pricing suggested by APS, especially negative pricing, the savings in energy costs could easily outweigh the higher capital costs for energy storage.

- (4) APS asserts that “system reliability and projected growth suggest an optimum size for additions in the range of 50 to 125 MW.”¹³ How this “need” for an optimal sized unit relates to growth is unclear since APS wants to install all 500 MW by 2018 even though it is in excess of the capacity that is needed for growth out to 2018. APS’ growth assertion is even more unclear since smaller units can be added incrementally to closer align with resource needs over time. As for reliability, smaller units increase reliability by presenting a smaller impact when any unit is out of service whether for maintenance or forced outage. Finally, smaller units provide even more flexibility and efficiency (at least, in the case of the Wartsila units) in dealing with the type of solar variability that APS suggests is possible, “depending on cloud cover”.¹⁴ I believe that APS has unfairly penalized the smaller units in its evaluations.¹⁵

¹¹ *Id.* At page 6.

¹² APS would be paid to store the energy when prices are negative at Palo Verde.

¹³ See APS’ presentation, entitled “Ocotillo Expansion Technology Selection for Peaking Service Duty” at page 4.

¹⁴ Technical Review Packet at page 7.

¹⁵ See APS’ presentation, entitled “Ocotillo Expansion Technology Selection for Peaking Service Duty” at page 7.

- (5) APS has listed pumped storage as requiring a 10-year lead time. Surely, APS is aware of the ongoing Longview Energy Exchange (“LEE”) project scheduled to be in service by 2021.¹⁶ Ostensibly, the LEE project would provide many of the generating characteristics APS identified as desirable. APS could likely serve its interim resource needs by any number of other means such as contract extensions, delayed retirements and/or market purchases during the summer months.
- (6) APS has penalized the Wartsila units for air emissions even though their data shows that CO₂ emissions for the LMS 100s and the Wartsila 18V50 are 1,115 lbs/MWh and 1,021 lbs/MWh, respectively.^{17,18} Also, APS notes that has the Wartsila units consume no water, but apparently did not consider this fact in screening out the Wartsila units from further evaluation.^{19,20}

Q. WHAT ARE YOUR CONCERNS WITH THE WAY APS PLANS TO MEET ITS POWER SUPPLY NEEDS?

- A. I’ve addressed APS’ needs assessment above, including resource-specific needs. Of equal concern is APS’ approach to addressing alternatives to the Ocotillo Modernization project (i.e, eliminating them without evaluation) and presenting the case for the Ocotillo Modernization Project. For instance, APS’ presentations selectively take into account APS’ interaction with the market. On the one hand, APS provides a “stand-alone” load duration curve of its system load requirements

¹⁶ See

http://www.westconnect.com/filestorage/2152012_Longview_Energy_Exchange_SWAT_Presentation_Final.pdf.

¹⁷ APS Revised Appendix D.3 – Generation Technologies from APS 2014 IRP, page 286

¹⁸ APS Ocotillo CT3-7 Expansion Report, Table 1 – Combustion Turbine Screening Results

¹⁹ APS Revised Appendix D.3 – Generation Technologies from APS 2014 IRP, page 286

²⁰ APS Ocotillo CT3-7 Expansion Report, Table 1 – Combustion Turbine Screening Results

to demonstrate a need for peaking capacity.²¹ Then, on the other hand, APS asserts that “highly flexible generation [is] needed to facilitate market purchases” at the Palo Verde market hub.²² It would be better if APS evaluated (if it has not done so) and presented preferred and alternative resource plans in a way that addresses these two “needs” in a more unified manner. Essentially, APS’ system is not isolated and, in my view, it makes no sense to evaluate or to present “needs” as if it were. APS’ evaluations should include a realistic expectation of how APS’ resource decisions will take into account the market on behalf of its ratepayers.

Q. WHAT ALTERNATIVES ARE YOU RECOMMENDING THAT APS FULLY AND FAIRLY EVALUATE?

A. APS’ selection of LMS100s may turn out to be the best resource option; but I am not convinced, based on the concerns stated above. I am recommending that APS evaluate the following alternatives to the Ocotillo Modernization Project:

- (1) Given the over-generation circumstances that APS has described, APS should evaluate energy storage options, including the LEE pumped storage project discussed above. Also, other energy storage technologies should be given further consideration. For example, Liquid Air Energy Storage (“LAES”) which is also known as Cryogenic Energy Storage (“CES”) is an option. “Although novel at a system level, the components and sub-systems of LAES systems are mature technologies available from major OEMs and, as a whole, the technology draws

²¹ Technical Review Packet at page 4.

²² *Id.* At page 6.

heavily on established processes from the power generation and industrial gas sectors, with known costs, performance, and life cycles.”²³

- (2) From my review, as discussed above, APS may have: (i) unjustly penalized the Wartsila 18V50 units, (ii) not considered some of their benefits and (iii) possibly ignored “penalty factors” that should have been applied to the LMS100 units. APS should re-assess the Wartsila units, and especially the possibility of staging their deployment over time to more closely align with APS’ growing needs.
- (3) Given the rapidly changing environment in the electric power industry (e.g., Energy Imbalance Market implementation, emphasis on renewables and energy storage, etc.), APS should evaluate resource plans that postpone thermal resource additions at this time. These “postponement plans” could include any combination of delayed retirements, transmission improvements, contract renewals and interim market purchases in lieu of the Ocotillo Modernization Project as proposed. It is critically important to understand the cost consequences to the ratepayers of constructing more capacity than is needed, especially with respect to sensitivities such as lower than expected load growth. Also, APS has described possible over-generation conditions that energy storage is more suitable at addressing as discussed above. It is therefore important to understand how resource technology decisions now can adversely affect APS’ ability to make more appropriate resource technology decisions (e.g., energy storage) in the not-too-distant future.

²³ See <http://energystorage.org/energy-storage/technologies/liquid-air-energy-storage-laes>.

Q. COULD YOU PLEASE SUMMARIZE YOUR CONCLUSIONS AND RECOMMENDATIONS?

A. The following are my conclusions, based on a review of APS presentation materials.

- (1) APS' forecasted growth rate of over 3% per year appears to be too high.
- (2) APS has the opportunity and, therefore, should evaluate and present the potential for securing favorable purchase power contracts to replace those that are expiring.
- (3) APS should not exclude consideration of resource options outside the Phoenix Valley Load Pocket.
- (4) APS should consider resource options that do not have as severe cost consequences as the proposed LMS100s when staged over a longer period of time; and APS should evaluate the cost benefits to ratepayers of delaying construction of new thermal additions until APS could more fully utilize the entire amount of capacity being constructed.
- (5) APS should fairly and fully evaluate energy storage resource options that actually mitigate the potential over-generation condition that APS has identified and facilitate market purchases when prices are low or even negative at the Palo Verde hub.
- (6) APS has unfairly penalized smaller units in its evaluations.
- (7) APS' assertion that pumped-storage requires a 10-year lead time does not apply to the ongoing Longview Energy Exchange project; therefore APS should evaluate participation in this energy storage project along with suitable means of meeting APS' interim requirements until its projected in-service date of 2021.

- (8) APS' evaluations should include a realistic expectation of how APS' resource decisions will take into account the market on behalf of its ratepayers.
- (9) APS should re-assess the Wartsila 18V50 units, and especially the possibility of staging their deployment over time to more closely align with APS' growing needs.
- (10) APS should evaluate resource plans that postpone thermal resource additions at this time.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.