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2008 JUN -4 P 4:41
AZ CORP COMMISSION
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Mail Station 9708
PO Box 53999
Phoenix, Arizona 85072-3999

June 4, 2008

Docket Control
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, Arizona 85007

04-06-08P04:50 RCVD

RE: Arizona Public Service Application on Resource Planning
Docket No. E-01345A-08-0010

On January 7, 2008, Arizona Public Service Company (APS) filed a Resource Alternatives Application, which indicated that APS is initiating a series of stakeholder meetings regarding resource planning. The fourth meeting was held on May 9, 2008. Attached please find the meeting report, attendance list, and copies of presentations made at that meeting.

Meeting notices, agendas, presentations, reports, and other related information regarding APS' Resource Alternative Stakeholder meetings can be found at www.aps.com/resources. If you have any questions regarding this process or would like to be added to the service list, please send an email to ResourceAlternatives@aps.com.

Sincerely,

Barbara Klemstine

Attachment

CC: Ernest Johnson
Terri Ford
Barbara Keene
Interested Parties

**ARIZONA PUBLIC SERVICE COMPANY
RESOURCE ALTERNATIVE PLANNING
STAKEHOLDER MEETING REPORT
Docket No. E-01345A-08-0010**

DATE: May 9, 2008
TIME: 8:30 a.m.
PLACE: Arizona Public Service Corporate Headquarters, Room 2 South
400 North 5th Street, Phoenix, Arizona 85004

ATTENDANCE: See attached attendance list.

TOPICS:

1. Updates and Recent Developments
2. A Clean Electric Energy Standard for Arizona
3. Arizona Renewable Energy Assessment
4. Resource Technology Comparison
5. APS Renewable Energy Overview

Copies of the Presentations are available on the website:
<http://www.aps.com/resources>

DISCUSSION:

- **Dr. Marty Rozelle** of the Rozelle Group Ltd., facilitator for the stakeholder meetings, briefly explained the process and ground rules for the meetings.
- **Brad Albert**, APS Director of Resource Planning, discussed the outreach effort that APS is currently undertaking regarding resource planning issues. The audience for the new outreach will include community leaders and large customers, among others. APS personnel have been trained for this effort; the packets being used for this outreach will be posted on the Resource Planning page on the APS website (www.aps.com/resources).
- **David Berry**, Western Resource Advocates, and **Amanda Ormond**, The Ormond Group LLC, presented “A Clean Electric Energy Strategy for Arizona.”

David Berry:

Mr. Berry began by providing a brief history of the trends in the electric power sector. By way of example, in the 1960s, the cost for nuclear power was not yet competitive as a resource option. However, the cost premium relative to conventional resources was falling, and it was believed that nuclear technologies would improve over time. These same attributes could be applied now to renewable resources.

The Clean Energy Strategy Study, which covers the period from 2007 to 2025, is a statewide study. Its purpose is to demonstrate that load growth over this period can be served by clean energy technologies. Given that the study began in 2007, some of the assumptions are now

out of date. As set forth on page 6 of the presentation, the study came to three major conclusions:

1. Growth in demand can be met reliably with a portfolio consisting largely of energy efficiency savings and renewable energy.
2. The clean energy strategy has more stable and more certain costs than conventional coal and gas-fired resources.
3. Serving growth in demand with clean energy resources results in minimal increases in CO₂ emissions.

The study relied upon historical growth, which shows that sales double about every 20 years. The resource options examined include energy efficiency, renewable energy (wind, solar, geothermal, biomass), conventional generation (coal, gas, nuclear and hydropower), and advanced coal technology (which is not yet commercially available). A general comparison of each of these options, including the status, lead time, carbon dioxide (“CO₂”) emissions, cost, and other miscellaneous items, is set forth on page 9 of the presentation.

The clean energy strategy recommended by the study provides for the following resource mix to address growth in demand: about one-third is met by energy efficiency savings; about one-third is met by renewable energy resources; and the remaining amount is accounted for by natural gas fired generation and a small amount of advanced coal with carbon capture.

With regard to renewable resources, the study has developed a proposed mix through 2025. Depending, however, on the cost and performance of the resources, the mix could change. For example, concentrated solar power (“CSP”) could play a larger role, as evidenced by the new Solana project.

Although there has been some question as to the amount of demand growth that can be addressed through energy efficiency, the study looked at the impact of energy efficiency programs as reported by the American Council for an Energy Efficient Economy 2006 scorecard. In looking at the effect of efficiency programs on growth of electricity sales in an average state, it shows a reduction in sales. According to the study, the more aggressive efficiency programs can reduce growth in GWh sales by 60% as compared to having no energy efficiency programs.

One of the benefits of renewable energy resources is that they have stable and predictable costs and emit little or no CO₂. As a result, the use of renewable energy and energy efficiency can allow a utility to hedge against high fuel costs and CO₂ emission regulation costs. Fossil fuel prices are much more volatile and much more difficult to project. Also, the cost of complying with CO₂ regulation is uncertain and could exceed fuel costs in certain scenarios. The resources proposed by the study would emit relatively small amounts of CO₂ in comparison to the resources currently used to serve Arizona’s load.

Presentation Discussion:

Discussion ensued regarding the cost to achieve the energy efficiency savings shown for the year 2024 (*see* page 10 of the presentation). One of the risks with energy efficiency is the ability to stimulate the market to participate.

The participants also discussed the assumptions that have changed since the completion of the study. For example, advanced coal technology may have been modeled differently, and CSP may have been a more significant component of the renewable resources.

Amanda Ormond:

Ms. Ormond continued the presentation by examining policy issues. The various policies in the state relating to renewable energy include: the Renewable Energy Standards (“RES”); financial incentives; green pricing; interconnection and net metering; energy efficiency programs in state building standards and utility energy efficiency programs; integrated resource planning process; and climate change initiatives.

The ultimate policy recommendations from the study are as follows:

1. Significantly increase energy efficiency programs. Substantive work needs to be done to incent energy efficiency and to remove financial barriers to large scale utility efficiency (some states use incentives relating to the rate of return).
2. Expand the renewable energy standard and apply it to the entire state—should get to 20% by 2022—the standard should be a floor rather than a ceiling.
3. Authorize investment in transmission for renewable energy. Transmission should be constructed ahead of time; renewables take less time to construct.
4. Commercialization of emerging technologies. Cost recovery for utilities pursuing new technologies is critical. Utilities need assurances on a forward looking basis. Policies that discourage innovation must be modified.
5. Develop a statewide Research and Development program.

Presentation Discussion:

A discussion ensued about the best means to reach these goals. Some issues would be addressed at the Corporation Commission; others at the Legislature or with Congress. Examples of matters that are currently at the Corporation Commission include a docket to determine pre-approval of a purchase power agreement for energy from the proposed CSP Solana plant. On the federal level, tax credits, such as the extension of the Investment Tax Credit, are essential.

- **Ryan Pletka**, Black & Veatch (“B&V”), presented the “Arizona Renewable Energy Assessment.”

As an initial matter, Brad Albert advised that B&V’s assessment had been utilized in the preparation of the transmission assessment by the Southwest Area Transmission (“SWAT”) Renewable Energy Task Force. This information was supplemented (not revised) by

information from participants in the SWAT Renewable Energy Task Force, which was a separate effort from the B&V study.

Mr. Pletka explained that B&V prepared the study for APS, Salt River Project and Tucson Electric Power. The objectives for this study included an assessment of the development potential for near-term Arizona renewable energy resources. The study included an accounting of the economic variables for developing these resources, and focused on the non-distributed requirement under the Corporation Commission's RES rules.

The B&V methodology included screening technologies and characterizing the resource potential; identifying potential projects and estimating project performance and costs; estimating the cost to generate electricity from those projects and developing resource supply curves; and assessing and forecasting the relative economics of the projects.

With regard to resource costs, renewable resource costs vary greatly based on the resource quality. There are a limited number of very good sites for renewable projects, and the costs will rise as projects are developed at the best sites. The B&V supply curves captured this effect.

The B&V study examined a variety of technologies. In the biomass/biogas realm, direct-fired, cofiring, anaerobic digestion and landfill gas projects were examined. The study also looked at hydroelectric, wind, and geothermal resources. For solar, the assessment examined parabolic trough and dish sterling, as well as commercial and utility-scale solar photovoltaic projects. With the methodology described above, B&V prepared various maps highlighting the best sites for the specific technologies. These maps screen out the most sensitive areas, where development would not be practical.

As shown on the chart on page 11 of the presentation, there is a large potential for solar thermal resources at a fairly consistent price. The levelized cost shown in the report does not take into account the value of the energy. The supply available is approximately 4300 MW, although theoretically there is more potential in Arizona.

With regard to wind, the potential areas for development within the state are more restricted. The B&V report screened out certain areas based on available transmission, constructability, and environmentally sensitive areas. In addition, the maps in the report do not include current projects, although those projects were analyzed as part of the report. As shown in the assessment, there is approximately 1000 MW available. The cost for wind, however, has increased approximately 20% over the last year as a result of increased costs for labor and materials.

For biomass projects, most potential projects relate to the forests and are limited in Arizona. The B&V report looked at co-firing and direct fired projects. The supply curve for biomass shows approximately 40 MW available. The potential for biogas projects is also relatively limited. The two potential areas are landfill and digester gas. The supply curve shows approximately 20 MW potential from biogas.

The B&V report also examined hydropower. The potential Arizona hydropower locations are in existing canals and as part of an upgrade of the Glen Canyon project. Any remaining projects would be at much higher costs. It is not certain that the Glen Canyon upgrade would be realistic to complete.

Geothermal resources in Arizona are relatively unknown and unexplored, and there has been little interest to date in pursuing geothermal projects. There is some potential for projects in the eastern part of the state, albeit at a fairly high cost. The B&V analysis shows the potential for approximately 35 MW from geothermal projects.

On page 19 of the presentation, there is a summary of the levelized costs for the potential renewable resources in Arizona. As shown in the chart, there are limited megawatts available from the lowest cost resources.

B&V developed a renewable energy integration model based on its analysis. The integration model combined the supply curves for each of the resources. The renewable energy demand for each year was forecasted, and each year, the least cost resources were built (*i.e.*, removed from the supply curve). Time has an impact on the model, as some projects cannot be built in the near term and certain technologies should improve over time. The major model's limitation is that avoided costs are not explicitly included, which is important for solar. The transmission assessment for the model is simplified and no integration costs are included for wind resources. Also, out-of-state resources are not included in the model.

The results of the integration model can be seen starting at page 22 of the presentation. As shown in the graph, solar and wind should be the primary resources to meet the RES requirements. The various mixes of resources under the model for 2009, 2017, and 2025 are included in the presentation. Based on the model, the mix will change over time as the lower cost items are utilized first. By 2025, a large amount of the requirement will be met by solar resources.

In conclusion, the assessment found that there appears to be sufficient resources in Arizona to meet the RES requirements.

Presentation Discussion:

Discussion ensued about changes that have occurred following the completion of the report. Mr. Pletka explained that the cost of most resources has increased, although solar photovoltaic has declined. Also, active development of large solar projects and wind projects has increased.

Further discussion occurred regarding the purposes of the assessment. Mr. Pletka explained that the purpose was comparative economics rather than a recommendation. The objective was to look at how much of each resource is available and the relative costs.

There was also discussion about the differences in the findings for wind resources between this report and Western Resource Advocates ("WRA") report. One difference is that the

WRA analysis took into account out-of-state resources, while the B&V report only addressed Arizona resources.

- **Paul Smith**, APS Manager, Generation Market Analysis and Planning, presented “Resource Technology Comparisons.”

The purpose of Mr. Smith’s presentation was to examine specific technologies and their costs. In looking at resources choices, APS examines demand side programs, renewable resources and conventional resources. Numerous considerations are factored into the analysis, including reliability; environmental impacts; potential carbon cost; capital cost; average delivered cost; economic value; availability; fuel price volatility; technology risk; permit/license processes; the construction period for the resource; development risks; customer response; and water usage.

In performing an average delivered cost analysis, APS looks at the lifetime levelized cost of a resource at an assumed capacity factor. This is used as a screening tool to help guide the next steps in the process and is based on utility financing assumptions. The goal is to keep technologies on a level playing field, but it is not meant to specify a procurement method. The analysis does have limitations, which include the following:

- It does not capture interaction with existing generation or transmission systems.
- It quantifies cost, but not value.
- It does not capture reliability impacts.
- It does not effectively compare diverse resource types.

In order to mitigate these limitations, APS developed and uses a value adjusted supply analysis. Other utilities are also starting to use this type of analysis.

The chart on page 6 of the presentation sets forth a comparison of the range of costs and performance assumptions for the various resources. The capital costs in the chart include AFUDC (allowance for funds used during construction). For conventional resources, the information in the chart is based on specific engineering studies. For renewable resources, APS must rely on publicly available information, as there is not as much experience with these resources. With regard to heat rate, a lower number is better (heat rate is not relevant for renewable resources). For the capacity factor for wind, the numbers in the chart are for Arizona wind resources (New Mexico and Wyoming wind resources have higher capacity factors). All of the baseload resources have a 75% capacity factor. The last column in the chart lists the transmission miles associated with each resource.

The chart on page 7 of the presentation sets forth the forecasts for various fuel prices. Natural gas prices are higher now than in the forecasts set forth in the presentation and are forecasted to increase.

On page 8 of the presentation, the chart shows the delivered cost of new resources (lifetime levelized with a 2007 in-service date). For energy efficiency, there is a range which represents expected cost for a broad set of different energy efficiency measures. For nuclear resources, the capital costs on the chart are understated, given current estimates. As shown

on the chart, combined cycle resources are less capital intensive, but have higher fuel costs. Integrated Gasification Combined Cycle (“IGCC”) resources are cleaner burning, but have higher transmission costs. The cost estimates for IGCC do not include the cost of carbon capture and sequestration. Wind resources also have higher transmission costs.

There are uncertainties associated with each of these resources. Examples of these uncertainties are set forth on page 9 of the presentation. For example, the loss of federal tax credits would have an impact on wind, geothermal and solar thermal. For IGCC and nuclear, there is the risk of higher capital costs. The graph also indicates that there are additional costs related to the uncertainties for each of the resources.

The value adjustment to delivered cost captures the differing value (*i.e.*, avoided cost) that technologies bring to the system. The benefit of the analysis is that it more closely replicates the anticipated result from a full-blown portfolio level economic analysis. The delivered cost of generation is put on a capacity and energy equivalent basis so that there can be a fair comparison of resources that have differing capacity factors. The analysis incorporates APS’s system factors.

In looking at a comparison of solar (with storage) and wind generation, solar has more energy value than wind. The on-peak capacity factor for wind (based on a Northern Arizona site with a 30% annual capacity factor) is 42%, and the solar on-peak capacity factor (with 6 hours of storage) is 87%. As this demonstrates, solar meets peak load needs very well.

An example of the value adjustment analysis is set forth on page 14 of the presentation. Value adjustment makes the resources comparable. As shown on the chart, there is no value adjustment for combined cycle resources. For solar thermal, the value adjustment brings down the levelized cost, as there is an operational credit and a capacity credit. For wind resources, the value adjustment increases the cost. Overall, with the value adjustment, solar thermal resources and wind resources on existing transmission are fairly competitive with combined cycle resources. IGCC resources are more expensive; the same is true for wind resources with new transmission. The cost of transmission will increase the cost for wind resources that require new transmission construction, so that solar resources would present a better value proposition.

Finally, the summary chart on page 15 of the presentation demonstrates the resource potential for each of the resource options discussed. Most of the resources fall within the “medium” potential category, except for wind with new transmission and IGCC, which fall within the “low” potential category (energy efficiency is shown as “high/medium” potential as it is dependent on customer acceptance and participation).

Barbara Lockwood, Manager, Renewable Energy, presented “APS Renewable Resource Overview”

Ms. Lockwood discussed the regulations that exist regarding renewable energy in Arizona. The RES Rules, which were adopted by the Corporation Commission, are energy based requirements. The requirement is 1.75% of retail sales in 2008 and increases to 15% by 2025. Distributed energy is required under the RES as a percentage of the total—10% in

2008 increasing to 30% by 2012 (half is residential and half is non-residential). The Corporation Commission approved APS's implementation plan and funding mechanism for 2008 in April 2008, which includes total funding of \$34 million, with customer incentives of \$22 million.

APS's renewable generation includes 130 MW of current capacity. The Aragonne Mesa wind project in New Mexico began operation in 2006 and provides 90 MW. The CE Turbo project is a geothermal resource in Salton Sea, California that commenced in January 2006 and provides 10 MW. The Snowflake White Mountain Power project is a 24 MW biomass project in Snowflake, Arizona. The output of the project is shared with Salt River Project. The project began delivering test energy in April 2008.

A future solar project is the Solana project, which will use concentrating solar power technology with thermal energy storage. Abengoa Solar will own and operate the project. Solana will produce 280 MW, which will provide energy enough for 70,000 homes. APS has contracted for the full output of the plant. It has a tentative completion date of 2011 and will employ approximately 85 people when operational.

The chart on page 9 of the presentation shows renewable generation projections from current projects, as compared to the RES requirements. Because there is some risk that problems could arise with proposed renewable projects, APS continues to examine new projects. While RES compliance is essential, the Company's main driver is the desire for resource alternatives.

Ms. Lockwood discussed the Joint Development Group ("JDG"), which consists of a consortium of southwestern utilities. The JDG issued a Request For Proposal in December 2007 for 250 MW of concentrating solar power. The JDG short-listed potential projects recently, and project selection could occur during the summer of 2008. In Northern Arizona, APS is working with the Northern Arizona Renewable Energy Group ("NAREG"), comprised of businesses and governmental entities in Northern Arizona, on renewable energy issues. A memorandum of understanding was signed in February 2008 with eight initial participants who committed to purchase 5% of their energy through APS's Green Choice Program. This commitment will increase 5% per year. The objective of NAREG is to aggregate demand until there is sufficient demand to facilitate a renewable energy project in Northern Arizona.

Ms. Lockwood also discussed distributed energy. The solar incentive program provides incentives for both residential and non-residential installations and has shown significant growth each year. As noted in the presentation, larger installations are expected, including a significant installation at Arizona State University.

As of May 1, 2008, new technologies are eligible for the program. These include solar hot water heating, solar photovoltaic, biomass/biogas, geothermal, solar daylighting, small scale wind, non-residential solar pool heating, solar heating, ventilation and air conditioning, fuel cells that use only renewable fuels and renewable combined heat and power. Projections for distributed generation are set forth on page 16 of the presentation; they indicate that there is work to be done to meet the RES requirements in the future. In order to meet these

requirements, APS is focusing on outreach and marketing, including website upgrades, the Green Loan Program, stakeholder meetings, training classes for customers, events and earned media, paid media, and direct mail campaigns.

Ms. Lockwood discussed the distributed energy study currently underway at APS. The objective is to quantify the costs and benefits of large quantities of distributed energy in APS's system. APS has engaged RW Beck as the managing consultant for the study. Solar technologies are the focus of the study, and the final report is due in February 2009.

Lastly, Ms. Lockwood discussed the various Green Power options available from APS. This is a voluntary program outside of the RES and does not factor into RES compliance.

Presentation Discussion:

A discussion ensued about net metering. APS has a pilot program for net metering, and the rulemaking at the Commission is still in process. A public comment session on net metering is scheduled for June 5, 2008.

FUTURE MEETINGS AND AGENDAS:

The next two stakeholder meetings will be held on the mornings of June 6 and July 11. Both of these meetings will be held at the APS corporate headquarters.

APS Resource Alternatives Planning Workshop
Friday May 9, 2008
Attendance List

<u>Name</u>	<u>Company</u>
Amanda Acheson	Coconino County Sustainable Building
Amanda Ormond	The Ormond Group LLC
Amy LeGere	Foresight Wind Energy
Barbara Keene	Arizona Corporation Commission
Bob Baltes	Distributed Energy Association of Arizona
Brian Hageman	Deluge, Inc
Carminé Tilghman	Tucson Electric Power
Chuck Skidmore	City of Scottsdale
Dana Diller	Nextlight Renewable Power
Daniel Musgrove	Universal Entech
David Berry	Western Resource Advocates
Debbie Siggard	Fennemore Craig, P.C.
Dimitrios Laloudakis	City of Phoenix
Greg Patterson	Arizona Competitive Power Alliance
Greg Swartz	Piper Jaffray
Ira Domsy	Arizona Department of Environmental Quality
Jaina Moan	Northern Arizona University
Jana Brandt	Salt River Project
Jeff Schlegel	Southwest Energy Efficiency Project
Jim Arwood	Arizona Department of Energy
Jim Petersen	Salt River Project
John Coggins	Salt River Project
Joe McGuirk	Sun Miner, LLC
John Ellis	Embry-Riddle Aeronautical University Prescott Campus
Jon Findley	Sierra Club
Jason Gellman	Roshka DeWulf & Patten, PLC
Karen Nally	Moyes Storey
Lew Dodendorf	Salt River Materials Group
Lee Tanner	Solar Mission Technologies
Lew Alton	Azure Sky
Mark Flynn	Northern Arizona University
Mark Marshall	K. R. Saline & Associates, PLC
Marshall Whitmire	RCI, Surveys Inc.
Martha Roberts	Environmental Defense Fund
Marty Rozelle	The Rozelle Group

APS Resource Alternatives Planning Workshop
Friday May 9, 2008
Attendance List

<u>Name</u>	<u>Company</u>
Michael Hallam	Lewis & Roca
Michael Neary	Desert Sun Solar, Inc
Mike Sheehan	Tucson Electric Power
Peggy Goodrich	URS Corporation
Ray Williamson	Arizona Corporation Commission
Roger Clark	Grand Canyon Trust
Ron Hubert	Hozho International
Ryan Pletka	Black & Veatch
Scott Wakefield	Residentia Utility Consumers Office
Stephen Mellentine	Salt River Project
Steven Reiner	David Evans & Associates
Toby Voge	Tucson Electric Power
Travis Wright	STMicroelectronics
Valerie Rauluk	Sun Edison