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BEFORE THE ARIZONA CORPORATION COMMISSION





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IN THE MATTER OF THE APPLICATION OF ARIZONA PUBLIC SERVICE COMPANY FOR APPROVAL OF THE COMPANY'S 2011 DEMAND SIDE MANAGEMENT IMPLEMENTATION PLAN.

DOCKET NO. E-01345A-10-0219

**COMMENTS OF WESTERN RESOURCE ADVOCATES ON APS' RESIDENTIAL SHADE TREE PILOT PROGRAM**

## I. Introduction

Western Resource Advocates (WRA) hereby submits comments on Arizona Public Service Company's (APS') residential shade tree pilot program as filed on August 2, 2010. In 2009, WRA prepared a framework for design and delivery of a shade tree program for the Phoenix area as described in its report, *Phoenix Green: Designing a Community Tree Planting Program for Phoenix, Arizona.* That report examined the energy savings and cost effectiveness of a tree planting program in the Phoenix area and reviewed the experience of 24 community tree planting organizations nationwide to identify key components of successful shade tree programs. These comments are based on the findings in that report and provide the Commission with an independent evaluation of APS' proposed program.[1]

Only about 13% of the Phoenix area has plant cover. In contrast, American Forests has recommended that 25% of a metropolitan area in the Southwest and dry West be covered by tree canopy (35% in suburban residential zones, 18% in urban residential zones, and 9% in central business districts). Unlike many metropolitan areas, the Phoenix area lacks a large scale tree planting program that would help move the region closer to a 25% canopy goal.

These comments cover the following topics: energy savings from shade trees, cost-effectiveness of shade trees, APS' program design (tree selection, delivery processes, use of a pilot), and recommendations. WRA recommends that the Commission approve APS' proposed shade tree pilot program.

[1] Details supporting the data and conclusions presented in these comments may be found in the report. Copies of WRA's report have been provided to Staff and APS.

## II. Energy Savings

Trees casting shade on the west, east, or south side of a house reduce heat gain and reduce energy usage for air conditioning. WRA reviewed several studies of residential energy savings from shade trees in low desert areas of the Southwest. There is a range of savings estimates that reflects different study methods. The median estimate of residential energy savings from a mature tree in the Phoenix area is 214 kWh per year (measured at the customer's meter). Three mature shade trees would save about 642 kWh per year per house. To maximize energy savings, shade trees for southwestern areas should have a broad spreading form and a dense crown and should shade windows, if possible.

To determine aggregate energy savings, it is necessary to consider both growth rates and mortality rates of trees. Figure 1 shows the combined energy savings effect of these factors (measured at the customer's meter) assuming 10,000 small shade trees were planted each year for 10 years. At peak, energy savings would be about 14,000 MWh per year and savings over the 30 years shown in the graph would be 275,000 MWh. For APS' proposed pilot program, in which 5,000 trees are planted in 2011, WRA estimates lifetime (30 year) energy savings at 16,629 MWh measured at the customer's meter and 18,075 MWh including losses.

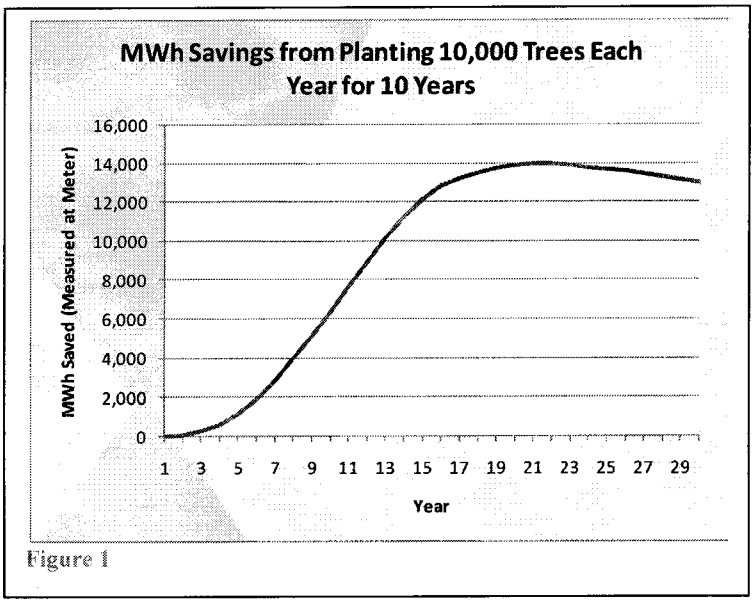

Figure 1

## III. Cost Effectiveness

APS concluded that its proposed shade tree program would be cost effective. WRA re-analyzed the cost effectiveness of a tree planting program as presented in the *Phoenix Green* report to reflect APS' program design and updated natural gas costs and other assumptions. We find that a shade tree program in the Phoenix area would be cost effective. In particular, we assumed that 5,000 trees are planted in Phoenix for the pilot program, that a mature tree saves 214 kWh per year, that trees grow and die over a 30-year time horizon, and that the annual survival rate corresponds to the schedule reported by the American Public Power Association.[2]

[2] "Tree Mortality & Growth Rate Factor," American Public Power Association web site, www.appanet.org/treeben/data/growthmortalitydata.asp. We also assumed that trees would attain 50% of their shading capability in the sixth year after planting and 100% in the thirteenth year. Our City Forest in San Jose reports a survival rate of 90% of trees planted since 1994. An Iowa tree planting program found a survival rate of 91% three to four years after planting: see J.R. Thompson, D.J. Nowak, D.E. Crane, and J.A. Hunkins, "Iowa, U.S.

We made the following assumptions for our analysis: all costs are in constant 2009 dollars, program costs on a per-tree basis are $88.80 per APS' budget (including the cost of the trees), watering costs are at 2009 City of Phoenix water rates, watering would be needed only during the first five years, and tree maintenance costs average $6 per surviving tree per year.[3] Planting activity is assumed to be part of a gardening hobby and does not add cost.

It was also assumed that, on average, the marginal electric generation units have a heat rate of 9,400 Btu per kWh; fuel (natural gas) costs in 2011 are $5.80 per million Btu in 2009 dollars, escalating at a real rate of 2.7% per year; and avoided power plant operating and maintenance costs are $3 per MWh. Transmission and distribution system losses are assumed to be 8%. Avoided carbon dioxide emissions are assumed to be 900 pounds per MWh saved, and carbon dioxide emission regulation compliance costs are assumed to be $20 per metric ton.

Looking over a 30-year time horizon and applying a 3% real discount rate, the present value of the net benefits of the pilot program is $187,000. Therefore, under realistic assumptions, APS' pilot program is cost effective. For each 5,000 shade trees planted in the Phoenix area, $CO_2$ emissions from power plants would decline by about 7,400 metric tons over a 30-year period. In addition, there are other benefits not included in the calculation – the value of avoided or deferred generating capacity,[4] storm water runoff reduction, reductions of sulfur dioxide, nitrogen dioxide, carbon monoxide, and particulate matter in the atmosphere, and sequestration of carbon dioxide.[5] Also, urban trees provide aesthetic and wildlife benefits.

## IV. Program Design

**A. Tree Selection.** In its report, WRA recommended that shade tree programs for the desert Southwest utilize drought-tolerant species, especially those which are native to the region. Native species include: velvet mesquite (Prosopis velutina), honey mesquite (Prosopis glandulosa), screwbean mesquite (Prosopis pubescens), desert ironwood (Olneya tesota), southwestern sweet acacia (Acacia minuta), whitethorn acacia (Acacia constricta), blue palo verde (Cercidium floridum), foothills palo verde (Cercidium microphyllum), desert willow (Chilopsis linearis), and Texas ebony (Pithecellobium flexicaule). APS has selected various palo verdes and mesquites for its pilot program; some mesquites sold in Arizona are non-native varieties which have several desirable properties such as rapid growth and no thorns. APS' pilot

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Communities Benefit from a Tree-Planting Program: Characteristics of Recently Planted Trees," *Journal of Arboriculture* 30, no. 1 (January 2004): 1-9, see p. 4 and Tables 3 and 4.

[3] Maintenance costs based on E. Gregory McPherson et al., *City of Glendale, Arizona, Municipal Forest Resource Analysis*, Center for Urban Forest Research, USDA Forest Service, Pacific Southwest Research Station, Table 7, excluding administrative costs.

[4] WRA does not have sufficient information to accurately estimate the value of avoided capacity. APS included the value of avoided or deferred capacity in its analysis.

[5] See McPherson, *et al., op.cit.* regarding environmental benefits.

program tree selection is appropriate, but WRA suggests that the list of eligible species be expanded in the future to give homeowners more choices and to diversify the region's tree mix.

Water use is an important consideration in a desert region. APS has selected tree types that need very little supplementary watering (in addition to that supplied by rainfall).

**B. Delivery Process.** Community tree planting organizations play a central role in the greening of cities. They are typically nonprofit organizations that pursue programs to plant hundreds or thousands of trees each year, recruit volunteers to plant trees, educate the public, and develop and implement neighborhood, city-wide, or regional plans for urban vegetation. Program delivery strategies vary greatly -- see Table 1 for a summary of program logistics for several community tree planting organizations.

**Table 1. Tree Program Logistics**

| Program | Target | Logistics |
|---|---|---|
| Trees for Tucson and Tucson Electric Power (2009 program) | Individual residences | • Homeowners receive trees up to six-feet tall for $8 each if they agree to plant them on the east, west, or south side of the house.<br>• Older houses may receive up to four trees, newer houses up to two trees.<br>• Homeowner or group must submit an application.<br>• Trees are delivered to homes or to central location for group projects.<br>• Species available are drought-adapted.<br>• Written planting and care instructions are provided. |
| Sacramento Tree Foundation and SMUD | Individual residences | • Homeowners receive up to 10 free shade trees.<br>• Participants are directed to watch a video on how to plant a shade tree.<br>• Participants schedule appointment with community forester to discuss siting and selection of trees.<br>• Trees are delivered to the homeowner.<br>• Choice is given from about 30 deciduous tree species. |
| Roseville Urban Forest Foundation and Roseville Electric | Individual residences | • Homeowner selects location of tree and selects species from a list of 19.<br>• Homeowner purchases and plants trees according to siting and planting instructions.<br>• Homeowner submits a rebate form and receives a utility bill credit up to $30 per tree (maximum of six trees per household).<br>• Arborist may request to inspect the tree prior to homeowner receiving rebate. |
| Our City Forest and PG&E (San Jose) | Individual residences | • One free shade tree for San Jose customers of PG&E with air conditioning.<br>• Participant sends application to Our City Forest.<br>• Our City Forest representative makes a site visit to determine suitable species and site for tree.<br>• Participants receive tree care instructions and guidelines.<br>• Trees may be inspected within three months of planting. |
| Trees Forever and Alliant Energy Branching Out (Iowa) | Community | • Program provides grants to communities & volunteer groups for tree-planting projects.<br>• Trees Forever administers program (applications for grants, data tracking, training, support, analysis), assists with volunteer recruitment & training, provides technical assistance to communities. |

APS proposes to use a local nonprofit organization with experience in tree planting, education, and community involvement to implement its pilot program. The organization will use workshops and printed materials to educate consumers on tree selection, siting, and care and will use community events to distribute trees for pick-up by participants. APS customers can attend a workshop for free and would receive 2 or 3 five gallon trees (depending on the age of the house) at no charge. To obtain the free trees, customers must attend a workshop. APS will supplement the tree planting organization's activities with additional marketing.

WRA supports APS' proposal. In general, local tree planting organizations have expertise in tree planting and maintenance, have developed social networks and credibility within the community to attract participants and obtain volunteers, have developed education programs, and have developed and sustained large scale programs as indicated in Table 2.

**Table 2. Scale of Selected Tree Planting Programs**

| Program | Trees planted (life of program) | Average number of trees/year | Comments |
|---|---|---|---|
| Trees Forever/Alliant Energy Branching Out | 1,145,516 | 57,000 | Data are for Branching Out program only and exclude other programs of Trees Forever |
| Tree New Mexico | 950,000 | 50,000 | Seedling distribution (reforestation and conservation), plus urban and riparian plantings |
| Sacramento Tree Foundation/ Sacramento Municipal Utility District (SMUD) shade tree program | 450,000 | 23,700 | SMUD-supported portion of programs only, not entire Sacramento Tree Foundation effort |
| Trees for Houston | 360,000 | 14,000 | Trees and seedlings throughout the city |
| Greenscape of Jacksonville | 150,000 | 4,400 | Trees planted along streets and other public property |
| Trees Atlanta | 75,000 | 3,000 | Most trees planted in the central part of the city |
| Trees for Tucson/TEP | 57,500 | 3,200 | Data pertain to shade trees |

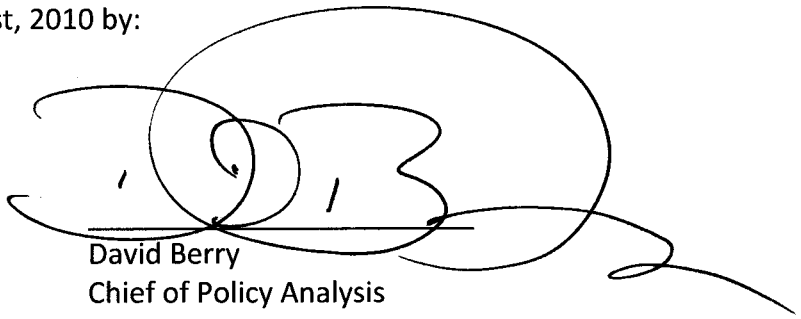
**C. Pilot Program.** APS proposes to conduct a pilot program with a goal of planting 5,000 trees in 2011. WRA agrees that a pilot program is appropriate as a first step. After making adjustments in response to the evaluation of the pilot program, we believe that APS should quickly scale up the program to plant at least 10,000 shade trees per year. Such a goal is realistic in light of the scale of programs indicated in Table 2.

## V. Recommendations

WRA recommends that the Commission approve APS' shade tree pilot program. The program is cost-effective, fills a gap in efficiency programs in the Phoenix area, and will utilize the expertise of a local nonprofit tree planting organization to implement the program. WRA also recommends that the list of eligible species be expanded in the future to offer more choices,

and that, following an evaluation of the pilot program, APS make appropriate modifications and expand the scale of the program.

Respectfully submitted this 26th day of August, 2010 by:



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