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BEFORE THE ARIZONA CORPORATION COMMISSION

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Arizona Corporation Commission

DOCKETED

AUG 2 2010

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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

**SECOND SUPPLEMENTAL FILING
RE: NEW NON-RESIDENTIAL
MEASURES (INCLUDING FILINGS
FOR AUGUST 2 AND AUGUST 16, 2010)**

I. INTRODUCTION

On June 1, 2010, Arizona Public Service Company ("APS" or "Company") filed its 2011 Demand Side Management Implementation Plan ("2011 Plan"). In that filing, APS committed to submit three supplemental informational filings ("Supplemental Filings") on July 1, 2010, August 2, 2010 and August 16, 2010. The Supplemental Filings would update and expand the information provided on new programs and measures contained in the 2011 Plan, including (if necessary) updating the estimates of the programs' budget and megawatt hour ("MWh") savings. On June 30, 2010, APS filed its First Supplemental Filing to its 2011 Plan. The First Supplemental Filing provided information about APS's new Non-Residential Energy Efficiency measures as proposed in the 2011 Plan.

APS hereby makes this Second Supplemental Filing, which includes proposed programs and measures for both August 2, 2010 and August 16, 2010 Supplemental Filings.¹ The Second Supplemental Filing provides detailed information and cost-effectiveness test results for two new Residential Energy Efficiency programs and one new Residential Energy

¹ The 2011 Plan has therefore, been filed in its entirety with this Second Supplemental Filing. APS will not make a filing on August 16, 2010 as it had originally contemplated.

1 Efficiency measure, again as proposed in APS's 2011 Plan.² The additional detail contained
2 in this Second Supplemental Filing, which is attached hereto as Exhibit A, reflects a revised
3 Residential Energy Efficiency budget.

4 **II. SUPPLEMENTAL INFORMATION FOR NEW RESIDENTIAL PROGRAMS**
5 **AND MEASURE**

6 **A. New Programs and Measures**

7 The proposed new programs and measure contained in this Second Supplemental
8 Filing are energy efficiency measures applicable to APS's Residential Energy Efficiency
9 programs. Table 1 below lists the proposed programs, measure and the respective cost
10 effectiveness test results for each program/measure included in this Second Supplemental
11 Filing:

12 **Table 1**
13 **Summary of Proposed New Programs and Measures**
14 **Residential Energy Efficiency Programs**

Description	Societal Benefit to Cost Ratio
New Programs	
Multi-Family Energy Efficiency Program ³	1.7
Shade Tree Pilot Program	1.6
New Measure	
HVAC Diagnostic Measure	1.2

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20 **B. Updated Plan Savings**

21 The plan savings of the proposed programs and measure outlined in this section were
22 included in APS's 2011 Plan; however, this Second Supplemental Filing contains a revised
23 MWh savings over the lifetime of the measures installed in 2011. APS estimates that the
24 2011 Plan will save an annual 391,000 MWh in 2011, while saving an estimated 3,651,000
25 MWh over the lifetime of the measures installed in 2011 (as compared to the estimate of

26 ² In its June 1, 2010 filing, APS had contemplated filing a Room Pressure Relief – Home Performance with ENERGY
27 STAR® in its August 2, 2010 filing. As further explained in Exhibit A, APS determined that the Room Pressure Relief is
not cost-effective; thus, that program is not included in this Second Supplemental Filing.

28 ³ In its June 1, 2010 filing, APS had scheduled this program filing for August 16, 2010; however, APS is including the
program in its Second Supplemental Filing.

1 3,683,000 MWh included in the Company's June 1st filing). As filed in its 2011 Plan, APS
2 anticipates that the Energy Efficiency ("EE") and Demand Response ("DR") programs'
3 annual energy savings will be as follows: 352,000 MWh energy savings from EE Programs;
4 and 39,000 MWh energy savings from DR Programs. APS anticipates the net benefits to
5 society over the lifetime of the program measures will be \$125 million. Finally, APS
6 believes the programs in the 2011 Plan are cost effective and will provide all APS customers
7 with significantly increased opportunities to save on their monthly electric bills.

8 **III. UPDATED BUDGET AND PROGRAM RESULTS**

9 The costs and benefits of the proposed programs and measure discussed in this Second
10 Supplemental Filing were included in the estimates provided in APS's 2011 Plan filed
11 June 1, 2010; however, this Second Supplemental Filing contains revised and updated
12 program budgets. Accordingly, APS revised the Demand Side Management Adjustor Charge
13 ("DSMAC"), and the savings estimates, which include: 1) megawatt demand savings; 2)
14 annual and lifetime MWh energy savings; and 3) societal benefits.

15 In sum, the revised budget contained in this Second Supplemental Filing shows an
16 increase in the Existing Homes program budget due to the expansion of the Residential
17 Diagnostic measure. This increase offsets the slight budget reduction due to the elimination
18 of the Room Pressure Balancing measure and to compensate a change in net-to-gross ratios
19 for the Air Conditioning Rebate measures, which otherwise would have resulted in lost
20 energy savings. Finally, the Shade Tree Pilot Program budget increased slightly from the
21 budget filed on June 1, 2010. The other program budgets remain unchanged.

22 **IV. UPDATED DSMAC**

23 In its June 1, 2010 filing, APS committed to update the final amount of the DSMAC in
24 its Supplemental Filings. Thus, in this Second Supplemental Filing, the Company is updating
25 its DSMAC to reflect the final budget for the 2011 Plan. The DSMAC would be effective
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27
28

1 with bill cycle one of March 2011. The 2011 DSM budget and revenue requirements for the
 2 DSMAC are summarized below⁴:

<u>2011 DSM Budget</u>	
Total Energy Efficiency (<i>with incentive</i>)	68,573,000
Demand Response	10,620,000
<i>Total 2011 DSM Budget</i>	\$ 79,193,000
<u>2011 Revenue Requirements for DSMAC</u>	
Total 2011 DSM Budget	\$ 79,193,000
Plus: 2009 Budget Carryover to 2011 (1/3)	5,332,979
Minus: Amount Recovered in Base Rates	(10,000,000)
<i>Subtotal</i>	\$ 74,525,979
Minus: Credit for Gains from Asset Sales	(118,079)
Plus: Recovery of Under Recovered True-up Balance for 2007/2008 Costs	359,100
<i>Total Revenue Requirement for DSMAC – March 2011</i>	\$ 74,767,000

14 Attachment 3 to Exhibit A contains all the final schedules supporting the DSMAC
 15 proposed to be effective in March 2011 and the corresponding customer charges necessary to
 16 recover the projected EE and DR costs. The recovery of proposed revenue requirements will
 17 result in an increase in the DSMAC as follows:

	Current Charge	Proposed
Per kWh	\$ 0.001646	\$ 0.002694
Per kW	\$ 0.720083	\$ 0.960

21 The estimated 2011 DSMAC charges of \$0.002694 per kWh and \$0.960 per kW are
 22 comparable to the present charges of \$0.001646 per kWh and \$0.720083 per kW. The bill
 23 impact is anticipated to be less than 1% for all customer classes, or approximately \$1.23 per
 24 month for a typical residential customer.

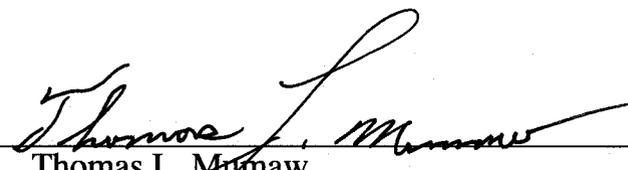
28 ⁴ For a detailed explanation of the chart summarized below, see APS's Application for Approval of the Company's 2011 Demand Side Management Implementation Plan, dated June 1, 2010.

1 APS requests that the final DSMAC be approved concurrent with final approval of the
2 2011 DSM Plan, which the Company requests by the beginning of December 2010 so that all
3 Plan components can be implemented by the first quarter of 2011.

4 **V. CONCLUSION**

5 APS requests the Commission consider and approve, as soon as practicable, these new
6 Residential programs and measure. This will allow APS to complete the necessary
7 preparatory work prior to program launch, and offer the benefits of these new programs and
8 measure to customers as soon as possible in 2011.

9 RESPECTFULLY SUBMITTED this 2nd day of August, 2010.

10
11
12 By: 

13 Thomas L. Mumaw
14 Linda J. Arnold

15 Attorneys for Arizona Public Service
16 Company

17 ORIGINAL and thirteen (13) copies
18 of the foregoing filed this 2nd day of
19 August 2010, with:

20 Docket Control
21 ARIZONA CORPORATION COMMISSION
22 1200 West Washington Street
23 Phoenix, Arizona 85007

24 

Exhibit A



**Arizona Public Service
Company**

**Demand Side Management
Implementation Plan
2011**

**Supplemental Information
Filing**

August 2, 2010

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I. Introduction

Arizona Public Service Company ("APS" or "Company") filed its 2011 Demand Side Management Implementation Plan ("2011 Plan") on June 1, 2010. On June 30, 2010, APS filed the first supplemental informational filing ("First Supplemental Filing") to its 2011 Plan which provided additional information regarding APS's proposed new Non-Residential Energy Efficiency ("EE") measures proposed in the 2011 Plan. This second and final supplemental informational filing ("Second Supplemental Filing") provides detailed information and cost-effectiveness test results for two proposed new Residential EE programs and one proposed new Residential EE measure.

APS had previously planned to make three supplemental filings to its 2011 Plan. However, the Company has included details of its proposed new Residential Multi-Family Energy Efficiency Program, previously planned to be filed on August 16, 2010, with this Second Supplemental Filing. The 2011 Plan has, therefore, been filed in its entirety with this Second Supplemental Filing.

The costs and benefits of the proposed programs and measure in this Second Supplemental Filing were included in the estimates provided as part of the 2011 Plan filed June 1, 2010. The Residential EE estimated budget, however, has been revised and updated in this Second Supplemental Filing. The Demand Side Management Adjustor Charge ("DSMAC") estimate included in the 2011 Plan has been revised and updated accordingly. Savings estimates including 1) megawatt ("MW") demand savings, 2) annual and lifetime megawatt-hour ("MWh") energy savings, and 3) societal benefits, have also been revised.

As stated in the 2011 Plan filed June 1, 2010, the proposed 2011 DSM Program Portfolio is targeted to save an annual 391,000 MWh of energy which is equivalent to the goal of achieving savings equal to 1.25% of total energy resources in 2011. APS expects to meet the DSM energy savings goal of 391,000 MWh by achieving 352,000 MWh of savings from EE programs and 39,000 MWh of savings from DR programs. This Second Supplemental Filing includes updated savings and budget numbers for residential programs but continues to be designed to achieve 352,000 MWhs of total savings. The Demand Response ("DR") program has not changed. By meeting this annual goal, APS estimates peak demand saving of 68.6 megawatts ("MW") from EE and 77.5 MW from DR in 2011, while saving an estimated 3,651,000 MWh over the lifetime of the measures installed in 2011.

By implementing the 2011 EE portion of the DSM Plan, APS expects to spend an estimated \$68.6 million in 2011, but produce \$123 million of net benefits to customers. APS believes all of the proposed programs and measures are cost effective (as measured by the Societal Cost Test) and will provide all APS customers with increased opportunities to save on their monthly electric bills.

Societal costs and net benefits have been changed slightly to correct a mathematical error discovered in the societal cost reported in the original June 1, 2010 filing and in the June 30, 2010 First Supplemental filing. As corrected, the societal costs are generally higher and the net benefits lower than previously reported.

Table 1 lists each of the new Residential programs and measure proposed in this Second Supplemental Filing of APS's 2011 Plan, and the results of the associated cost effectiveness tests for each:

Table 1
Summary of Proposed New Programs and Measures
Residential Energy Efficiency Programs

Description	Societal Benefit to Cost Ratio
New Programs	
Multi-Family Energy Efficiency Program	1.7
Shade Tree Pilot Program	1.6
New Measure	
HVAC Diagnostic Measure	1.2

II. New Residential Programs

A. *Multi-Family Energy Efficiency Program*

The Multi-Family Energy Efficiency Program ("MEEP") is a proposed new addition to the APS DSM Portfolio for 2011. The program will target multi-family properties and dormitories. This market segment typically and historically has not been motivated to participate in existing APS EE programs, because property owners generally do not benefit from the energy savings realized. In most cases, the property owner/manager does not pay for the tenants' energy costs, and is thus not motivated to improve the energy efficiency of their property. This program is intended to reach this previously unreached segment.

The MEEP will take a three track approach to address the many challenges in reaching the multi-family market:

1. The first track addresses energy efficiency in the individual dwelling units and features a direct install component that will provide simple energy savings

measures purchased and delivered to the property manager by APS. Property managers or owners, however, will be responsible for all installation costs.

2. The second track addresses energy efficiency in common areas by leveraging the contact with the landlord, property manager or customer to direct property managers toward additional rebates available through APS's Non-Residential Solutions for Business program.
3. The third track addresses energy efficiency in the construction and renovation of new multi-family buildings. It will include a per unit incentive for new construction and major renovation projects. Similar to the current APS ENERGY STAR[®] Homes Program, these incentives will encourage builders and developers to construct projects that exceed standard building code.

The desired outcome in the implementation of a multi-family program is to realize long-term energy savings for the rental community and to improve the standards by which multi-family structures are built and maintained. For additional details about the proposed Residential MEEP, see Attachment 1.

B. Shade Tree Pilot Program

APS is proposing to conduct a Shade Tree Pilot Program in 2011 in partnership with a local non-profit agency, similar to *Trees for Tucson* (the agency that implements Tucson Electric Power's current Shade Trees Program). Through this agency, APS will host tree planting workshops throughout the Phoenix metropolitan area that will educate customers on successful tree planting and care, and create home-specific planting maps using Google Earth to illustrate proper tree location.

By participating in a tree planting workshop, APS customers will be eligible to receive desert-adapted shade trees at no cost. The goal of this program will be to encourage customers, through education and incentives, to plant shade trees in areas near their homes so that the energy used to cool their homes will be reduced. For additional details about the proposed Shade Tree Pilot Program, see Attachment 2.

III. New Residential Measure

A. Residential HVAC Diagnostic Measure

1. Measure Concept, Description and Baseline Conditions

APS proposes to add a new measure to its Residential Existing Homes Heating, Ventilation and Air Conditioning ("HVAC") program. The proposed Residential HVAC

Diagnostic (“Residential Diagnostic”) measure will provide APS residential customers with a financial incentive to have an advanced diagnostic tune-up on their existing air conditioning or heat pump unit so that it operates more efficiently, thus reducing both demand and energy usage. The main components of the Residential Diagnostic measure are the correction of the refrigerant charge, leak repair (if necessary), condenser coil cleaning, and air flow verification. These tasks are performed and verified on-site with advanced diagnostic equipment that records the unit’s performance status before and after the work is done. The performance data is sent to APS where it is reviewed for accuracy and completeness before providing the customer with an incentive.

According to a 2002 field study of 13,000 units in California conducted by the Proctor Engineering Group, a recognized expert in this field, 57% of existing units are either over or under charged¹, and 19% have an air flow problem. Combined, these problems can reduce the efficiency of a HVAC unit by up to 10%. Additionally, the outdoor condenser coil is exposed to the elements and gets very dirty in a desert climate. If it is dirty, it will not dissipate heat as well, thus further reducing the unit’s efficiency. This is an affordable measure (\$50 to \$80 after the incentive) that helps correct these problems. It saves energy, extends the life of the equipment, and provides peace of mind for APS customers while allowing the Company to reduce its demand and energy requirements.

The Residential Diagnostic measure will be limited to 5,300 units in the first year. The limit allows APS to gather field data needed to verify the energy and demand savings in the Arizona market before the measure is made available to all customers and contractors. It will be open to customers and contractors on a first come, first served basis. Only 40 contractors will be allowed to participate in the first year. APS expects the Residential Diagnostic measure to be effective in its service territory, but the Company is limiting participation until it can verify the measure’s field performance.

2. Target Market

The Residential Diagnostic measure will target residential APS customers in existing homes that have heating and cooling equipment three years old or older. There are approximately 450,000 APS residential customers in that demographic, comprising the maximum potential market for the program. Annual participation, if the program becomes fully operational, is estimated to range from 10,000 to 50,000 units. The focus for this measure is on APS residential customers in single family homes. Units on multi-family homes are also eligible to participate if there is a residential account. Many of these dwellings are master-metered and would be served through the APS Commercial Diagnostic measure that is a component of the Solutions for Business program.

¹ What Can 13,000 Air Conditioners Tell Us?, 2002, T. Downey and J. Proctor

3. Participant Eligibility and Requirements

The Residential Diagnostic measure is available to APS residential customers who have residential whole house heating and cooling systems that are most likely to need this service, i.e., are at least three years old. The other requirements are:

- Package or split systems must be two to five tons in size.
- Equipment must be connected to a duct system.
- Evaporative coolers, window units and mini-splits do not qualify.
- Incentive amounts are per unit for residential systems with a maximum of five units per home.
- Consistent with the threshold eligibility criterion of units at least three years old, customers can participate in this measure once every three years. APS does not believe it is beneficial to do this more frequently.

4. Measure Rationale and Objectives

The objective of the Residential Diagnostic measure is to improve the operating efficiency of existing heating and cooling equipment without incurring the upfront cost of purchasing new high efficiency equipment. Based on the results of the Proctor Engineering Study, there are thousands of units in the APS service territory that are improperly charged or that have air flow problems. APS's field experience also supports the results of that study. If the problems are corrected, both customers and the utility will save energy and reduce costs.

Customers will be offered an incentive of \$100 to help offset the cost of an advanced diagnosis and tune-up of their homes' heat pump or air conditioner. The tune-up must include the verification and, if necessary, the correction of the refrigerant charge, refrigerant leak repair, and condenser coil cleaning, and air flow verification.

Heating and cooling equipment tune-ups are nothing new in the Arizona market. Most HVAC contractors offer tune-ups each spring and fall with prices ranging up to \$150. The services provided with these tune-ups are as varied as the prices. The typical tune-up is usually more of a visual inspection for obvious problems with the equipment than an actual tune up. It is uncommon for the technician to test the refrigeration system to verify that the charge is correct. Checking the airflow or cleaning the condenser coil is even more unusual. Additionally, even if all this work is done, it is typically not verified. Therefore, the customer has no real way of being sure the work was done correctly. APS's proposed Residential Diagnostic measure requires that all four primary components of an advanced diagnostic tune-up are included and the system performance

is verified by recording both the pre tune-up and post tune-up performance data. APS believes the comprehensive nature and the verification component of its Residential Diagnostic Measure sets it apart from others, and that its measure should be effective because of these differences.

Table 2
Market Barriers and Measure Elements

Market Barrier	Measure Element
<ul style="list-style-type: none"> • Lack of knowledge about the key factors necessary to get tangible energy savings from a HVAC tune-up 	<ul style="list-style-type: none"> • Marketing materials describing the most important factors
<ul style="list-style-type: none"> • Higher cost of advanced diagnostic tune-up compared to what is typically offered in this market 	<ul style="list-style-type: none"> • Provide incentive to offset higher cost of advanced diagnostic tune-up • Customer education and marketing materials that explain the difference and highlight the value of the advanced tune-up

5. Product and Services Provided

Services provided to the customer through this measure include:

1. Check thermostat operation
2. Clean filter or replace (customer supplied)
3. Verify air flow is acceptable with advanced diagnostic equipment or flow hood
4. Check system for refrigerant leaks and repair
5. Verify system refrigeration charge with advanced diagnostic equipment and correct if needed
6. Clean outdoor condenser coil
7. Inspect fused disconnect
8. Inspect wiring and tighten electrical connections
9. Inspect contactors, relays, and pressure controls
10. Inspect electrical safety circuits
11. Check voltage and amperage to all motors
12. Inspect/clean indoor blower wheel and motor for dirt build-up
13. Inspect bearings and lubricate all moving parts (as required)
14. Inspect belt and adjust tension (as required)
15. Inspect and clean condensate drain (summer)/check defrost operation (winter)
16. Inspect duct seal at unit and secure panels
17. Check evaporative cooler duct block-off (as required)
18. Explain and document all necessary repairs

6. Incentive Design

- The customer incentive is \$100 per system. The expected cost of the advanced diagnostic tune-up is from \$150 to \$180 before the incentive.
- APS is also proposing to offer a contractor equipment incentive of \$1,000 per advanced diagnostic device (maximum of two per company). This is to offset a portion of the \$3,600 cost of the required Stargate advanced diagnostic equipment, or its technical equivalent. A contractor is eligible for this incentive after completing 20 advanced diagnostic jobs that have been verified and accepted by APS.

7. Delivery Strategy and Administration

APS will work with an implementation contractor to deliver this measure. The implementation contractor that is currently working with APS on the existing Residential HVAC Air Conditioner Rebate and Duct Test and Repair measures will work with APS to provide the training, rebate processing and on-site inspections necessary to deliver this measure.

Independent HVAC contractors must complete training on the use of the Stargate advanced diagnostic equipment (or equivalent equipment) before they can offer the Residential Diagnostic measure to customers. Contractors must also be current participants in APS's Residential HVAC Air Conditioner Rebate measure and own the advanced diagnostic equipment. The number of contractors allowed to offer the rebate will be limited to 40 for the initial rollout of the program. As noted above, the Stargate advanced diagnostic equipment costs about \$3,600. The contractor, therefore, will need to have the opportunity to do enough diagnostic jobs to help offset the cost of the equipment. The limited number of contractors ensures that the initial 40 contractors will have the opportunity to secure enough jobs to cover the initial expense of participating in the measure. Currently, 11 contractors are using this advanced diagnostic equipment in this market. APS believes it can get 40 contractors to participate in Phase 1 discussed below.

- Program delivery will have three phases:

Phase 1: Limited Rollout

The measure will be implemented in the spring of 2011 with a cap of 5,300 Residential Diagnostic rebates. Only 40 contractors will be allowed to offer the measure during the rollout. Once the 5,300 rebates are paid, the measure will not be available again until the next phase is complete.

Phase 2: Measure Evaluation and Verification of Savings

A third party will conduct an evaluation of the Residential Diagnostic measure based on field research to verify the demand and energy savings and to evaluate the measure delivery methodology. The field research for this phase will be done concurrently with Phase 1. After the data is collected it will be reviewed and used to determine if a full scale rollout of the program is warranted. Measure improvements will be identified and implemented.

Phase 3: Unlimited Measure Implementation

If the evaluation of the measure confirms that it achieves cost effective energy savings, APS will remove the customer and contractor limits for the following year. The results of the field study will be included in the Company's Semi-Annual Report.

8. Marketing and Communications

During this measure's first year, or until the results for the Measurement, Evaluation and Research ("MER") field research is completed, marketing will be limited to bill inserts, direct mail from participating contractors, and the APS website. Since Phase 1 is limited to 5,300 rebates, APS will conduct only limited marketing of the measure in the spring of 2011. Depending on the response, additional marketing will be added as needed to reach the Phase 1 limits.

9. Implementation Schedule

- APS plans to roll out the measure in March 2011 and to continue it until the 5,300 rebate limit is reached.
- The MER phase will start in March 2011 with field research. The evaluation of the data and final evaluation report will be completed by the end of September 2011.
- Full implementation will begin in January 2012 if the measure proves effective, as expected.

10. Measurement, Evaluation and Research Plan

The MER plan is designed to use field research to validate the measure's demand and energy savings before it is offered to APS customers on a large scale. The potential participation in this program is significant, and APS believes that analysis of specific data from the Arizona market is necessary before the measure is offered on a large scale. The

MER contractor will conduct both pre tune-up and post tune-up unit analysis of equipment performance to validate the energy and demand savings per unit. The MER contractor will also analyze the net-to-gross ratio, potential improvements to the measure delivery process, data collection, contractor training and other normal MER activities. The unique aspect of this measure's MER plan is that the field research will be done concurrently with the initial rollout to determine if the measure achieves the performance necessary to justify offering it on a larger scale the following year.

11. Measure Budget

2011 Residential Diagnostic Measure Budget

	2011
Incentives	\$559,000
Delivery Costs	\$530,000
Incentives as % of Budget	51%
Total Budget	\$1,089,000

12. Estimated Energy Savings

Estimated savings for the measure are based on findings from similar programs in other states. The savings below are based on 5,300 units receiving the advanced diagnostic tune-up.

Total annual participation goals and demand and energy savings estimates are presented in the table below.

Residential Diagnostic Net Annual Energy Savings

	2011
Number of Expected Participants	5,300
Coincident Peak Demand Savings (kW) per Household (Average including line losses and reserve margin)	.48
Annual Energy Savings (kWh) per unit (Average including line losses)	600.4
Annual Energy Savings 2011 (MWh)	3,182

In addition to the savings shown above, it is estimated that the program will produce environmental benefits shown in the table below from savings achieved in 2011.

13. Residential Diagnostic 2011 Projected Environmental Benefits

Water Savings	6 Million Gallons
SO _x	85 Pounds.
NO _x	1,614 Pounds
CO ₂	3 Million Pounds

14. Benefit Cost Analysis Results

Contractor Incentive	\$1,000/Device
Customer Incentive	\$100/Unit
Customer Payback	2.1 Years
Societal Benefit to Cost	1.2

B. Room Pressure Balancing Measure

After a final review of the proposed measure, Room Pressure Balancing was not found to be cost effective enough to implement as a new program measure for 2011. Room pressure balancing improves efficiency and comfort by creating an air path for HVAC “supply” air to move from a bedroom back to the central return in the main body of the house when bedroom doors are closed. Further research indicated that the amount of time the average person closes their bedroom door is significantly less than initially estimated. Therefore, initial energy savings estimates were overstated.

At this time, APS will not file Room Pressure Balancing as a new measure. Due to the importance of this measure as a part of whole house energy retrofits, APS will continue to evaluate room pressure balancing for future filings.

The proposed funding and demand and energy savings included in the Residential Existing Homes Program Heating, Ventilation and Air Conditioning program budget for Room Pressure Balancing have all been removed. The savings reduction was offset, in part, by an expansion of the limited rollout of the Residential Diagnostic measure.

IV. DSM Budget

Budget projections are based on meeting the total DSM savings goal of 391,000 MWh in 2011. The budget projections are also based on recent experience in the APS market place, expected customer program participation growth, contractors’ experience in similar markets, and approval of all program enhancements within this 2011 Plan. This budget has been updated and supersedes the prior budget filed on June 1, 2010.

Compared to the proposed budget filed June 1, 2010, dollars allocated to the Existing Homes program increased due to expansion of the Residential Diagnostic measure to offset the removal of the Room Pressure Balancing measure and also to overcome some additional lost savings from a change in net-to-gross ratios for the air conditioner ("AC") Rebate measures. The Shade Tree Pilot Program budget increased slightly from the June budget. The other program budgets remain unchanged. Overall, the total estimated 2011 budget shown in Table 3 is higher than that reported in the June 1, 2010 filing by \$315,000.

A. *Energy Efficiency*

Table 3 shows the revised summary of the anticipated 2011 EE spending by program. This budget represents the estimated spending required to meet the 2011 EE savings goal of 352,000 MWh. These projections are based on APS's best estimates of market penetration for each program measure. To the extent that certain programs achieve greater or lesser success and market penetration than others, it is important to be able to adjust budgets between measures accordingly to maximize the effectiveness of the overall portfolio. Table 3 also includes the budget for the MER program and the estimated Performance Incentive for 2011.

APS 2011 New Residential DSM Programs & Measures
Second Supplemental Filing

Table 3
APS Energy Efficiency Programs
2011 Estimated Budget
(Dollars)

Program	Rebates & Incentives	Training & Tech Assistance	Consumer Education	Program Implement	Program Marketing	Plan & Admin	Financing	Program Total Cost
Residential								
Consumer Products	\$4,401,000	\$41,000	\$145,000	\$1,767,000	\$975,000	\$218,000	\$ 0	\$7,547,000
Existing Homes	\$9,715,000	\$334,000	\$365,000	\$3,129,000	\$807,000	\$257,000	\$205,000	\$14,812,000
New Construction	\$1,300,000	\$175,000	\$125,000	\$412,000	\$588,000	\$200,000	\$ 0	\$2,800,000
Appliance Recycling	\$315,000	\$ 0	\$21,000	\$996,000	\$314,000	\$15,000	\$ 0	\$1,661,000
Low Income	\$2,594,000	\$10,000	\$20,000	\$50,000	\$30,000	\$75,000	\$ 0	\$2,779,000
Behavioral	\$ 0	\$ 0	\$25,000	\$897,000	\$ 0	\$95,000	\$ 0	\$1,017,000
Multi-Family	\$590,000	\$10,000	\$25,000	\$555,000	\$62,000	\$35,000	\$ 0	\$1,277,000
Shade Trees	\$50,000	\$45,000	\$25,000	\$244,000	\$55,000	\$25,000	\$ 0	\$444,000
Totals for Residential	\$18,965,000	\$615,000	\$751,000	\$8,050,000	\$2,831,000	\$920,000	\$205,000	\$32,337,000
Non-Residential								
Large Existing	\$8,588,000	\$ 388,000	\$ 87,000	\$3,165,000	\$867,000	\$601,000	\$ 96,000	\$13,792,000
New Construction	\$1,769,000	\$ 127,000	\$ 25,000	\$1,025,000	\$284,000	\$180,000	\$ 0	\$3,410,000
Small Business	\$3,315,000	\$ 92,000	\$ 10,000	\$607,000	\$205,000	\$183,000	\$48,000	\$4,460,000
Schools	\$2,239,000	\$ 99,000	\$ 13,000	\$678,000	\$221,000	\$113,000	\$95,000	\$3,458,000
Energy Info. Services	\$138,000	\$ 10,000	\$ 5,000	\$20,000	\$10,000	\$12,000	\$ 0	\$195,000
Totals for Non-Residential	\$16,049,000	\$ 716,000	\$ 140,000	\$5,495,000	\$1,587,000	\$1,089,000	\$ 239,000	\$25,315,000
Segment Totals	\$35,014,000	\$1,331,000	\$891,000	\$13,545,000	\$4,418,000	\$2,009,000	\$444,000	\$57,652,000
% of Cost By Category	60.7%	2.3%	1.5%	23.5%	7.7%	3.5%	0.8%	

Program Costs	\$57,652,000
Measurement, Evaluation & Research	\$2,500,000
Performance Incentive	\$8,421,000
TOTAL	\$68,573,000

This budget is an estimate of the spending needed to meet the 2011 energy efficiency annual MWh savings goal. If this target is not met or is exceeded, then the spending and performance incentive will vary accordingly. Additionally, even if the target is met, the cost per kWh of savings may vary. For these reasons, the actual spending in 2011 will vary from the point estimate provided.

A total of 65% of the projected EE program costs will benefit customers directly in the form of incentives, training, technical assistance, or education. The other 35% of program costs is reserved for program implementation, marketing, and administration expenses. These other expenses are necessary to deliver the EE programs to customers.

B. Demand Side Management Adjustment Charge

As anticipated, some program budget numbers that flow into the calculation of the DSMAC have changed slightly from those reported in the June 1, 2010 DSM Plan filing. Therefore, the DSMAC proposed herein differ slightly from those that were included with the original filing.

The estimated EE program costs for both the Residential Existing Homes program and the Shade Tree Pilot Program have changed. The changes in the Residential Existing Homes budget estimate resulted from eliminating the Room Pressure Balancing measure from the request because of cost-effectiveness issues. Also, further assessment of Shade Tree Pilot Program required cost assumptions to be changed to address implementation costs unaccounted for in the initial estimates.

Attachment 3 contains the updated schedules supporting APS's proposed DSMAC and the corresponding customer charges necessary to recover the projected EE and DR costs.

The proposed new 2011 DSMAC of \$0.002694 per kWh and \$0.960 per kW, are comparable to the present charges of \$0.001646 per kWh and \$0.720083 per kW. The bill impact is anticipated to be less than 1% for all customer classes. For a typical residential customer using 1,177 kWh per month, the DSMAC change will add \$1.23 to the monthly bill increasing it from \$135.03 per month to \$136.26 per month (0.91%). APS is requesting that the Commission approve these DSMAC with the approval of its 2011 DSM Plan.

Table 4 is a summary of the DSM program costs APS used to calculate the 2011 DSMAC. With Commission approval, the 2011 DSMAC will be effective with billing cycle 1 of March 2011.

Table 4
Estimated DSM Program Costs for 2011 DSMAC Charge

2011 DSM Budget

Energy Efficiency Program Costs	\$ 57,652,000
Measurement Evaluation and Research	\$ 2,500,000
Total Energy Efficiency (before incentive)	\$ 60,152,000
Performance Incentive	\$ 8,421,000
Total Energy Efficiency (with incentive)	\$ 68,573,000
Demand Response	\$ 10,620,000
Total 2011 DSM Budget	\$ 79,193,000

2011 Revenue Requirements for DSMAC

Total 2011 DSM Budget	\$ 79,193,000
2009 Budget Carryover to 2011	\$ 5,332,979
Amount Recovered in Base Rates	\$ (10,000,000)
Subtotal	\$ 74,525,979
Credit for Gains from Asset Sales	\$ (118,079)
Recovery of True-up Balance	\$ 359,100
Total Revenue Requirement for DSMAC - 2011	\$ 74,767,000

V. DSM Energy Savings and Benefits

Table 5 provides details of the expected annual and lifetime energy savings and peak demand savings from each EE program and a summary of the net benefits for 2011. These values have been updated from the original filing. The Non-Residential societal costs and net benefits values have also been updated to correct a mathematical error in the original calculation. The original calculation did not factor in the Net to Gross Ratio ("NTG") or the non-incentive program costs.

The Residential Existing Homes program savings and net benefits changed for the same reasons the budget changed, i.e. removal of the Room Pressure Balancing measure and expansion of the Residential HVAC Diagnostic measure to compensate for that. The change in the NTG for the AC Rebate measures also affected the net benefits. Residential New Construction savings have been updated to include the peak demand savings from the ENERGY STAR[®] Plus higher tier measure. Both the Multi-Family and Shade Tree Pilot Program savings and net benefits changed due to updated information for those programs.

All of these benefits are in addition to energy savings, costs and net benefits achieved previously from measures installed during the 2005 through 2010 timeframe, which are reported in APS's Semi-Annual DSM Report filings. The lifetime energy savings reported in Table 5 are the estimated savings that will result over the expected lifetime of all program measures installed in 2011. It is anticipated that over the expected lifetime of all 2011 measures, the portfolio will produce net benefits of \$122.7 million, with a total societal benefit/cost ratio of 2.4 (societal benefits / societal costs = \$211.6 million / \$88.9 million).

APS 2011 New Residential DSM Programs & Measures
Second Supplemental Filing

Table 5
Energy Efficiency
Electric Savings Benefits¹
2011 Programs

	Capacity Savings MW	Annual MWh Savings	Lifetime ² MWh Savings	Societal Benefits	Societal Costs	Net Benefits
Residential						
Consumer Products	14.0	99,000	615,000	\$40,054,000	\$8,230,000	\$31,824,000
Existing Homes	15.9	21,000	256,000	\$28,400,000	\$19,000,000	\$9,400,000
New Construction	4.9	8,000	155,000	\$16,410,000	\$4,426,000	\$11,984,000
Appliance Recycling	1.6	11,000	66,000	\$4,241,000	\$1,346,000	\$2,895,000
Low Income ³	0.2	2,000	35,000	\$2,529,000	\$2,529,000	\$ 0
Conservation Behavior	3.4	25,000	25,000	\$1,097,000	\$1,017,000	\$80,000
Multi-Family	0.6	4,000	36,000	\$2,292,000	\$1,326,000	\$966,000
Shade Trees	0.4	1,000	19,000	\$1,560,000	\$979,000	\$581,000
Totals for Residential	41.0	171,000	1,207,000	\$96,583,000	\$38,853,000	\$57,730,000
Non-Residential						
Large Existing Facilities	15.1	101,000	1,287,000	\$ 62,565,000	\$ 23,608,000	\$ 38,957,000
New Construction	1.6	27,000	377,000	\$ 16,322,000	\$ 5,367,000	\$ 10,955,000
Small Business	6.1	28,000	439,000	\$ 19,517,000	\$ 5,115,000	\$ 14,402,000
Schools	4.6	23,000	314,000	\$ 15,658,000	\$ 4,795,000	\$ 10,863,000
Energy Information System	0.2	2,000	27,000	\$ 996,000	\$ 241,000	\$ 755,000
Totals for Non-Residential	27.6	181,000	2,444,000	\$115,058,000	\$39,126,000	\$75,932,000
Subtotal	68.6	352,000	3,651,000	\$211,641,000	\$77,979,000	133,662,000
Measurement, Evaluation & Research					\$ 2,500,000	\$ (2,500,000)
Performance Incentive					\$8,421,000	\$ (8,421,000)
Total	68.6	352,000	3,651,000	\$211,641,000	\$88,900,000	\$122,741,000
<p>1. All saving values are net of free riders and include system line losses.</p> <p>2. Refers to savings over the expected lifetime of all program measures.</p> <p>3. Program costs include weatherization and bill assistance. Societal Costs do not include Bill Assistance because it does not contribute to electric savings. Consistent with Commission Staff's analysis in Decision No. 68647, the societal benefits of the Low Income program are equal to the societal costs.</p>						

VI. Environmental Benefits

Table 6 shows the revised expected savings in water consumption and air emissions that will result from energy saved by the proposed portfolio of EE programs over the lifetime of the measures installed in 2011.

The values used to calculate the EE Environmental Benefits are as follows:

SOx	0.00445 Pounds/MWh
NOx	0.08455 Pounds/MWh
CO ₂	899 Pounds/MWh
PM10	0.0247 Pounds/MWh
Water	317 gallons/MWh (utility water savings only)

The avoided costs utilized in analyzing the EE measures being proposed in this filing include CO₂ and water costs. Monetization of CO₂ is based on \$20/Metric Ton beginning in year 2013, and escalated at 2.5% per year thereafter.

At Special Open Meetings held on April 9, 2010 and May 13, 2010, utilities were encouraged to monetize the externalities value of water and include this value in their Energy Efficiency Implementation Plans. While utilities are currently working toward establishing a statewide number through a stakeholder process, APS has valued utility water savings at \$650/acre foot based on the Company's most current water contract information. This value is incorporated as part of the Company's avoided cost calculation included in the benefit/cost calculation.

In addition to the utility water value, APS has valued the customer water savings at \$0.0040 per gallon of water saved. This calculation is a seasonal weighted average based on the City of Phoenix potable water rates in effect May 2010.

Table 6
Energy Efficiency Environmental Benefits
2011 Programs

	Water Mil Gal	SOx Pounds	NOx Pounds	CO2 Mil Lbs	PM10 Pounds
Residential					
Consumer Products	195	2,737	51,998	553	15,191
Existing Homes	81	1,139	21,645	230	6,323
New Construction	49	690	13,105	139	3,829
Appliance Recycling	21	294	5,580	59	1,630
Low Income	11	156	2,959	31	865
Conservation Behavior	8	111	2,114	22	618
Multi-Family	11	160	3,044	32	889
Shade Trees	6	86	1,632	17	477
Totals for Residential	382	5,373	102,077	1,083	29,822
Non-Residential					
Large Existing Facilities	408	5,727	108,816	1,157	31,789
New Construction	120	1,678	31,875	339	9,312
Small Business	139	1,954	37,117	395	10,843
Schools	100	1,397	26,549	282	7,756
Energy Information System	9	120	2,283	24	667
Totals for Non-Residential	776	10,876	206,640	2,197	60,367
Total	1,158	16,249	308,717	3,280	90,189

The environmental benefits listed above occur over the expected lifetime of EE measures installed in 2011.

ATTACHMENTS

Multi-Family Energy Efficiency Program

Attachment 1

Shade Tree Pilot Program

Attachment 2

DSMAC Schedules and Adjustor Rates

Attachment 3

Attachment 1

Attachment 1
Multi-Family Energy Efficiency Program

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<p>Attachment 1 Multi-Family Energy Efficiency Program</p>
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Multi-Family Energy Efficiency Program

Program Concept and Description

- The Multi-Family Energy Efficiency Program (“MEEP”) is designed to improve the energy efficiency of residential multi-family rental housing within the Arizona Public Service (“APS” or “Company”) service area.
- Residential rental properties are an important segment to reach with energy efficiency programs due to the fact that approximately 23% of APS residential customers live in multi-family dwellings (based on information from the 2008 APS Residential Home Use Survey). However, due to issues unique to the rental market such as the disconnect between property owners who are responsible for building upgrades and their renters who typically pay for energy costs, it can be a difficult market segment to reach unless innovative approaches are taken.
- The MEEP will rely on energy efficiency measures that have already been found to be cost effective by the Arizona Corporation Commission (“ACC” or “Commission”) in other currently approved APS programs (i.e. Compact Fluorescent Light bulbs (“CFLs”), low-flow showerheads, etc.), but these measures will be delivered in different ways in order to overcome the unique implementation barriers in the multi-family housing market.
- The program will consist of three elements to encourage efficiency upgrades in new construction and major renovation/rehabilitation projects, and energy efficiency retrofits of existing structures:
 - **Direct Install** – This element will provide energy efficient CFL light bulbs and low flow showerheads and faucet aerators at no cost to qualifying multi-family housing units. The MEEP will be implemented by working directly with multi-family rental property management companies. The program will provide the appropriate quantity of bulbs and fixtures for a property and the participating multi-family property managers will be responsible for the labor and/or cost of installation (with guidance and monitoring from an APS program implementation contractor).

Attachment 1 Multi-Family Energy Efficiency Program

- **Common Area Retrofits** – This element will leverage the on-site work being done in the direct install portion of the program to include a field audit of the common areas of the multi-family property (i.e. community rooms, offices, pools, laundry facilities, etc). The audit will identify potential efficiency upgrades and rebates within the APS Solutions for Business program that could be applied. In this program element, all program costs (other than the costs associated with the initial audit) and savings will be tracked within the Solutions for Business program – in essence, the MEEP will act as a program referral mechanism for the Solutions for Business program to engage multi-family property management companies in making energy efficiency upgrades to their common area spaces.

- **New Construction/Major Renovation** – This element will provide incentives to encourage builders of multi-family properties to include energy efficiency upgrades in their new construction and major renovation projects. APS will offer direct per-dwelling unit incentives to qualifying multi-family builders who meet the program’s prescriptive energy efficiency construction standards.

Target Market

The Multi-Family Energy Efficiency Program will be promoted to residential rental properties with five or more units. The focus of marketing, outreach and incentives will be the property owners or managers. A primary emphasis will be placed on larger and older, less-efficient complexes.

Current Baseline Conditions

Approximately 23% of APS residential customers reside in multi-family dwellings, which represent a significant efficiency potential for the APS program portfolio. However, the energy efficiency potential in the multi-family housing market remains largely untapped due to various market barriers, such as split incentives, capital constraints, and lack of awareness. For many rental property managers, energy efficiency improvements typically fall far below other types of improvements on their priority lists. Thus, multi-family housing units are often very energy inefficient. Although the current rebate programs offer some opportunities for energy efficiency improvements in this market, primarily through the Consumer Products and Residential HVAC Programs, there is not a comprehensive offering that addresses the unique needs of this market. Through the direct installation, and new construction/renovation implementation

<p>Attachment 1 Multi-Family Energy Efficiency Program</p>
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framework, the MEEP seeks to fill this important gap in the APS program portfolio and provide substantial energy savings.

Program Eligibility

All existing multi-family rental housing complexes and new multi-family rental construction projects within APS service territory with five dwelling units or more are eligible for the program. The program will promote energy efficiency improvements in both dwelling units and common areas. Eligible projects include new construction, major renovation and rehabilitation projects, and energy efficiency retrofits to existing facilities. Eligible facilities include multi-family rental apartment complexes only – owner occupied condominiums and townhomes will not be eligible for this program. Because these owner-occupied properties more closely resemble single-family homes, APS believes they are already being served with the current residential market program offerings.

Program Rationale

Approximately 23% of APS residential customers live in multi-family dwellings, making this an important segment for increasing energy efficiency within the APS service territory. However, there are unique issues that make this a challenging segment to reach with utility programs. Further complicating matters, multi-family housing is defined differently by different entities. Properties with two to four dwelling units typically fall under residential financing guidelines and the decision makers are usually individuals. Larger properties with five dwelling units or more typically fall under commercial lending guidelines, and decision makers are typically corporate, institutional, or trusts. As such, the decision-making process and access to capital varies between these two market segments. With this distinction in mind, the MEEP is designed to target the five and over unit multi-family housing segment.

Other utilities around the country are offering energy efficiency programs in an effort to capture some of the savings potential in the multi-family housing market including San Diego Gas and Electric, Southern California Edison, Pacific Gas and Electric, Austin Energy, Puget Sound Energy and others. Many of these programs offer similar incentives and delivery options to the program proposed by APS, and the major renovation/rehabilitation track is well aligned with the Environmental Protection Agency ENERGY STAR[®] Multi-Family Homes Program. By delivering this program with a focus on reducing key market barriers and targeting key decision makers, this program can contribute significantly to the achievement of APS's Demand Side Management program energy savings goals by lowering energy usage in multi-family housing complexes.

<p>Attachment 1 Multi-Family Energy Efficiency Program</p>
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Program Objectives

The objectives of the program are to:

- Reduce peak demand and overall energy consumption in the multi-family housing market segment
- Promote energy efficiency retrofits of both dwelling units and common areas in this market segment
- Increase overall awareness about the importance and benefits of energy efficiency improvements to the landlord and property ownership community
- Contribute to meeting the energy savings goals in the APS energy efficiency program portfolio.

Products and Services

This program will be delivered in three tracks in order to encourage energy efficiency upgrades in 1) energy retrofits of the rental units, 2) common areas of existing complexes, and 3) new construction and major renovation projects.

- **Rental Unit Direct Install** – The first program track will be delivered as a direct installation effort to improve the efficiency of existing multi-family rental units. The products to be provided in this track include CFL light bulbs, low flow showerheads, and low flow faucet aerators. In order to encourage participation among property management companies, the program will provide the bulbs and plumbing fixtures at no cost to participating properties. The installation costs and all labor associated with the product installation will be paid by the property manager. The installation can be completed either through the facility's existing maintenance or management personnel or via a program authorized installation contractor.

This element of the program will target large rental complexes with 100 or more units. To implement the program, an APS field representative will conduct a brief

Attachment 1
Multi-Family Energy Efficiency Program

lighting audit of a participating rental unit complex to determine the quantity and type of light bulbs and fixtures needed. The program will then deliver the bulbs and fixtures in bulk to the complex. Participating multi-family property managers will be responsible for the installation for all products. The APS program implementation contractor will work closely with participating properties throughout the project to assist in proper installation. APS will then conduct a post-installation visit to verify that all products have been installed. Low-flow showerheads and faucet aerators will be provided to properties with electric hot water heating.

- **Common Area Retrofits** – This element will leverage the on-site work being done in the direct install portion of the program to include a field audit of the common areas of the multi-family property (i.e. community rooms, offices, pools, laundry facilities, etc). The audit will identify potential efficiency upgrades and rebates within the APS Solutions for Business program that could be applied. The products to be promoted will include high efficiency retrofits of typical end uses encountered in the common areas of multi-family housing complexes such as lighting, HVAC, pool pump motors, coin operated laundry facilities, etc. For example, the lighting in the community rooms, workout facilities, lobbies, and other common areas could be retrofitted and receive the prescriptive incentives from the Solutions for Business program. In this program element, all program costs (other than the costs associated with the initial audit) and savings will be tracked within the Solutions for Business program – in essence, the MEEP will act as a program referral mechanism for the APS Non-Residential programs (Solutions for Business).

- **New Construction/Major Renovation** – This element will provide incentives to encourage builders of multi-family properties to include energy efficiency upgrades in their new construction and major renovation projects. APS will offer direct per-dwelling unit incentives to qualifying multi-family builders who meet the program’s prescriptive energy efficiency construction standards. The product that will be promoted will be whole building prescriptive energy efficiency upgrade packages. Building owners/developers will be offered an incentive per dwelling unit for installing select packages (Building Option Packages) of energy efficiency improvements in each unit. There will be four different building option packages offered, with one package targeting major renovation projects and the other three packages targeted to new construction projects. The new construction packages will offer progressively higher incentives for projects that meet higher levels of energy efficiency. The Building Option Packages (“BOP”) that will be used in the program

Attachment 1
Multi-Family Energy Efficiency Program

are included in Appendix 3. All measures in each package must be completed in order to receive the corresponding incentive.

Incentive Design

Track 1 – Rental Unit Direct Install

In this track of the program, incentives are designed to cover 100% of the purchase price of the three direct install measures; CFLs, low flow showerheads, and low flow faucet aerators.

Participating property management companies will be responsible for 100% of the measure installation costs. For the relatively inexpensive measures being promoted in this track of the program, the installation costs can be a significant percentage of the overall project cost.

This incentive design addresses the unique challenges of multi-family rental properties while also requiring an investment from participating facilities to ensure that they share in the overall costs of energy efficiency upgrades.

Track 2 – Common Area Retrofits

This program track leverages the point of contact with rental property managers to conduct an audit of the common areas of the participating properties. The audit will identify opportunities for the property to participate in the Non-Residential Solutions for Business incentive program. These incentives are all currently offered through the APS Non-Residential DSM programs and they have all been approved in prior decisions by the Commission.

Track 3 – New Construction/Major Renovation

This program track provides incentives to encourage the incorporation of energy efficient features in multi-family new construction and major renovation projects. The incentive design offers graduated tiers of builder incentives, with the incentive amounts increasing for meeting increasing levels of energy efficiency. In order to qualify for an incentive, the project must meet or exceed all of the prescriptive energy efficiency upgrades that are incorporated into a tier, also referred to as a BOP. There are three BOPs for new construction projects and one BOP that is specific to major renovation projects. Each of these packages is described below and detailed tables of the packages are included in Appendix 3.

<p>Attachment 1 Multi-Family Energy Efficiency Program</p>
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Builder Option Package One

Builders who meet all of the requirements of BOP One will be eligible for incentives of \$650/rental unit. Compared to current baseline levels in multi-family new construction, this option package will require energy efficiency upgrades in the following areas:

- Wall Insulation
- Window U-Factor
- Window Solar Heat Gain Coefficient (“SHGC”)
- Reduced Infiltration Rates
- Reduced Duct Leakage
- Higher Air Conditioning (“AC”) Efficiency (14 SEER minimum)
- Higher Furnace Efficiency (where applicable)
- Higher Heat Pump Heating Efficiency (where applicable)
- Reduced Lighting Power Density
- Reduced Miscellaneous Appliance Power Density
- Higher Hot Water Heating Efficiency

Builder Option Package Two

Builders who meet all of the requirements of BOP Two will be eligible for incentives of \$800/rental unit. In addition to meeting all of the required upgrades in BOP 1, this package will also require the following upgrades:

- Significant Additional Reduction in Lighting Power Density

<p>Attachment 1 Multi-Family Energy Efficiency Program</p>
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Builder Option Package Three

Builders who meet all of the requirements of BOP Three will be eligible for incentives of \$900/rental unit. In addition to meeting all of the required upgrades in BOP 2, this package will also require the following upgrades:

- Duct Leakage Reduced to 0% (ducts inside the conditioned space)
- Higher Air Conditioner (“AC”) Efficiency (15 SEER minimum)

Builder Option Package Four (Major Renovation)

Builders who meet all of the requirements of Building Option Package Four will be eligible for incentives of \$650/unit. This package is targeted to major renovation projects; therefore it is a standalone package that uses a different baseline than the new construction packages. Compared to the baseline, this package will require the following upgrades:

- Reduced Duct Leakage
- Higher AC Efficiency (14 SEER minimum)
- Higher Furnace Efficiency (where applicable)
- Higher Heat Pump Heating Efficiency (where applicable)
- Reduced Lighting Power Density
- Reduced Miscellaneous Appliance Power Density
- Higher Hot Water Heating Efficiency

Delivery Strategy and Administration

This program will be delivered by an implementation contractor with experience delivering similar programs in other states. APS will provide program management and oversight. The APS Measurement, Evaluation, and Research (“MER”) contractor will provide third party measurement and evaluation of the program.

<p>Attachment 1 Multi-Family Energy Efficiency Program</p>
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Marketing and Communications

The MEEP is designed to reach a specialized target market – property managers, owners, and builders of multi-family rental units (apartments). The marketing strategy for this program will focus on activities with local trade associations such as the Arizona Multi-Family Association. The program will include a field representative who will work through the local trade association to make direct contact with potential project partners. Some of the largest property management companies operate many rental unit complexes throughout the APS territory; these will be targeted to acquire a large number of participating properties at a time.

For the new construction and major renovation element of the program, the MEEP will coordinate with the Solutions for Business Non-Residential New Construction program to identify pre-existing contacts and coordinate marketing efforts to multi-family building owners and developers. Other marketing and communications strategies will include website content, newsletter and direct mail promotions, training seminars, and working with contractors and industry specialists.

Program Implementation Schedule

APS will commence implementation activities immediately upon program approval. Activities that must be completed prior to customer roll-out include hiring an implementation contractor and completing program forms, processes, and marketing materials. It is estimated that the program will roll out to customers within 60-90 days of program approval.

Monitoring and Evaluation Plan

Monitoring and evaluation for this program will include research to verify program impacts as well as analysis of the program processes. The APS Measurement Evaluation and Research contractor will develop a program research plan and conduct annual evaluation research on the achievements of this program.

<p>Attachment 1 Multi-Family Energy Efficiency Program</p>

Program Budget

Table 1 - 2011 Multi-Family Energy Efficiency Program Budget

Incentives	\$590,000
Delivery Costs	\$687,000
Incentives as % of Budget	46%
Total Budget	\$1,277,000

Energy Savings

Table 2 - 2011 Multi-Family Energy Efficiency Program Savings

Number of expected participants	5240 housing units
Annual coincident peak demand savings (including line losses and reserve margin)	577 kW
Annual energy savings	3,978 MWh
Lifetime energy savings	35,826 MWh

In addition to the savings shown above, it is estimated that the program will produce the following environmental benefits from savings achieved in 2011.

Table 3 - 2011 Projected Environmental Benefits

Water Savings	11,000,000 Gallons
Sox	160 Lbs
NOx	3,044 Lbs
CO2	32,000,000 Lbs

<p>Attachment 1</p> <p>Multi-Family Energy Efficiency Program</p>

Program Cost Effectiveness

The cost effectiveness of the program as a whole was assessed using the Societal Cost Test (SCT). Measure analysis worksheets showing all energy savings, cost and cost-effectiveness calculations are included in Appendix 1 and 2 to this document.

The cost effectiveness analysis requires estimation of:

- Net demand and energy savings attributable to the program
- Program implementation costs
- APS’s program administration costs
- The present value of program benefits including APS avoided costs over the life of the measures

The table below provides a summary of the benefit/cost analysis results for this program. A detailed benefit/cost analysis is presented in Appendix 2.

Table 4 - Benefit-cost analysis results

Cost Effectiveness Tests	SCT
Benefit/Cost Ratio	1.7

In addition to estimating the savings from each measure, this analysis relies on a range of other assumptions and financial data provided in the table below.

Table 5 - Other Financial Assumptions

Conservation Life (yrs)	6-20 years (depending on measure)
Ratio of Non-Incentive to Incentive Costs	1.2
Social Discount Rate	3.72%

Attachment 1
Multi-Family Energy Efficiency Program

Appendix 1 – Multi-Family Energy Efficiency Program 2011 Net Savings

DSM Estimated Net Energy Savings 2011 - Multi-Family Energy Efficiency Program													
Program	Measure	Coincident Demand kW savings per unit	Annual Energy kWh savings per unit	Number Unit 2011	Line Loss Factor (energy)	Line Loss Factor (demand)	Capacity Reserve Factor	NTG Adjust Factor	TOTAL kW Savings	Measure Life (yrs)	TOTAL Lifetime MWh Savings	Annual MWh Savings 2011	
MF Program	DI Showerheads	0.02	221.6	5,000	1.070	1.117	1.15	1.00	117.0	10	11,856	1,186	
	DI Aerators	0.01	75.14	10,000	1.070	1.117	1.15	1.00	126.9	10	8,040	804	
	DI CFLs	0.005	39.77	40,000	1.070	1.117	1.15	1.00	241.6	6	10,214	1,702	
	BOP 1	0.29	962.14	50	1.070	1.117	1.15	0.90	16.7	20	927	46	
	BOP2	0.35	1265.1	50	1.070	1.117	1.15	0.90	20.4	20	1,218	61	
	BOP 3	0.47	1376.4	40	1.070	1.117	1.15	0.90	21.8	20	1,060	53	
	BOP Retrofit	0.28	1303.6	100	1.070	1.117	1.15	0.90	32.4	20	2,511	126	
	Total				55,240					576.8		35,826	3,978

Where:

"Measure" = DSM measure

"Coincident Demand kW Savings per Unit" = Coincident Peak kW savings

"Annual Energy" = kWh savings/home/year

"Number Unit" = APS estimate of expected participation in 2011

"NTG Adjust Factor" = Net to Gross Ratio = factor to account for free riders

"Total kW Savings" = Total estimated demand savings from participating customers attributed to this program

"Measure Life" - Expected lifetime of the measure - based on DEER database and other national sources

"Total Lifetime kWh Savings" = Estimated total energy savings over the expected life of measures

Attachment 1
Multi-Family Energy Efficiency Program

"Annual kWh Savings" = Estimated annual energy savings from participating MF properties in 2011
Appendix 2 – Multi-Family Energy Efficiency Program 2011 Net Benefits

Net Benefits 2011 - Multi-Family Energy Efficiency Program

Measure	Avoided cost savings per Unit	Customer Increment Cost per Unit	PA Costs per Unit	SCT Costs per Unit	Number of Units	Total SCT Benefits	Total SCT Cost	SCT Net Benefits	SCT Benefit/Cost
Direct Install CFLs	\$13.44	\$2.00	\$4.58	\$6.58	40,000	\$666,118	\$263,200	\$402,918	2.5
Direct Install Showerheads	\$128.23	\$52.00	\$65.78	\$117.78	5,000	\$714,682	\$588,900	\$125,782	1.2
Direct Install Faucet Aerators	\$46.22	\$7.60	\$11.45	\$19.05	10,000	\$521,494	\$190,475	\$331,019	2.7
New Con/Renovation - Tier 1	\$1,316.50	\$902.95	\$250.00	\$1,062.66	50	\$65,825	\$53,133	\$12,692	1.2
New Con/Renovation - Tier 2	\$1,686.42	\$1,186.50	\$250.00	\$1,317.85	50	\$84,321	\$65,893	\$18,429	1.3
New Con/Renovation - Tier 3	\$1,971.97	\$1,366.60	\$250.00	\$1,479.94	40	\$78,879	\$59,198	\$19,681	1.3
Retrofit BOP	\$1,606.61	\$896.37	\$250.00	\$1,056.73	100	\$160,661	\$105,673	\$54,988	1.5
Total					55,240	\$2,291,979	\$1,326,471	\$965,508	1.7

WHERE:

"PA Costs" = Program Administrator Costs (also referred to as Non-Incentive costs)

"SCT" = Societal Cost Test

Attachment 1
Multi-Family Energy Efficiency Program

Appendix 3 – New Construction Builder Option Packages and Incentives

Characteristic	Baseline	BOP 1	BOP 2	BOP 3	Unit
Program Incentives	N/A	\$650	\$800	\$900	\$
Floor Area	860	860	860	860	sq ft
Number of Levels	1	1	1	1	1
Wall Type	Wood Frame 2x4, 16"o.c.				
Wall Insulation	R-13	R-19	R-19	R-19	hr-ft ² -°F/Btu.
Ceiling Insulation	R-30	R-30	R-30	R-30	hr-ft ² -°F/Btu.
Window Type	Double Pane Clear	Double Pane	Double Pane	Double Pane	
Window U-Factor	0.75	0.6	0.6	0.6	Btu/hr-ft ² -°F
Window SHGC	0.4	0.27	0.27	0.27	
Infiltration Rate	0.55	0.35	0.35	0.35	ACH
Duct Leakage	15%	5%	5%	0%	%
AC Efficiency	13	14	14	15	SEER
Furnace Efficiency	78	80	80	80	AFUE
HP Heating Efficiency	7.7	8.2	8.2	8.2	HSPF
Lighting Power Density	0.98	0.784	0.392	0.392	W/sq ft
Misc Power Density	0.92	0.875	0.875	0.875	W/sq ft
Domestic Hot Water	0.9	0.93	0.93	0.93	EF
Thermostat Setpoint - Cool	80	80 w/ SB*	80 w/ SB*	80 w/ SB*	°F
Thermostat Setpoint - Heat	69	69 w/ SB*	69 w/ SB*	69 w/ SB*	°F

*8 degree setback from 9am-4pm

Attachment 1
Multi-Family Energy Efficiency Program

Appendix 3 - Major Renovation Builder Option Packages and Incentives

Characteristic	Baseline - REN	BOP - REN
Program Incentives	N/A	\$650
Floor Area	860	860
Number of Levels	1	1
Wall Type	Wood Frame 2x4, 16" o.c.	Wood Frame 2x4, 16" o.c.
Wall Insulation	R-11	R-11
Ceiling Insulation	R-19	R-19
Window Type	Single Pane Clear	Single Pane Clear
Window U-Factor	1.11	1.11
Window SHGC	0.86	0.86
Infiltration Rate	0.7	0.7
Duct Leakage	15%	5%
AC Efficiency	13	14
Furnace Efficiency	78	80
HP Heating Efficiency	7.7	8.2
Lighting Power Density	0.98	0.392
Misc Power Density	0.92	0.875
Domestic Hot Water	0.9	0.93
Thermostat Setpoint - Cool	80	80 w/ SB
Thermostat Setpoint-Heat	69	69 w/ SB

Attachment 2

Attachment 2
Residential Shade Tree Pilot Program

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<p>Attachment 2 Residential Shade Tree Pilot Program</p>
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Residential Shade Tree Pilot Program

Program Concept and Description

Arizona Public Service (“APS” or “Company”) is proposing to conduct a Shade Tree Pilot Program in 2011. Utilizing a local non-profit agency similar to *Trees for Tucson* (the agency that implements Tucson Electric Power Company’s current Shade Trees Program), APS will host workshops to educate customers on the energy saving potential of desert adapted trees and provide training in proper planting and maintenance techniques. Participating customers will receive custom information on optimal planting locations, and ways to maximize the lifespan of the trees. APS will provide participating customers with up to three trees at no cost.

In the APS Residential Shade Tree Pilot Program, trees will be planted on the south, west and east sides of the home within 15 feet of exposed exterior walls and windows. The goal is to continue the Company’s commitment to protect and enhance urban forests, while further growing awareness and delivery of energy efficiency within its community.

Target Market

The Shade Tree Pilot Program targets APS Residential customers (primarily single family homeowners) who are looking to improve the efficiency or comfort of their homes. APS will target, but not limit, this program to older existing homes with inefficient exterior wall and window components.

The focus for this pilot will be on customers residing in the Phoenix metro area. Once the delivery model for this program is tested in the Phoenix market, APS will seek to expand the program throughout the Company’s service territory.

Current Baseline Conditions

In general, consumer awareness regarding energy efficiency and the impacts of shade are increasing. However, many existing homeowners do not fully understand the benefits and proper strategies for planting shade trees. Most customers planting trees do so primarily for aesthetic purposes and are not receiving the potential benefits that could increase the energy performance of their home.

Shade trees can improve the performance of exterior wall systems by reducing solar heat gain on sun-struck surfaces. As determined in a 2006 existing homes *Baseline Study*,¹ a typical existing home in the APS service territory includes the following exterior wall characteristics:

¹ Arizona Public Service Energy Efficiency Baseline Study, September 11, 2006, ICF International.

Attachment 2 Residential Shade Tree Pilot Program

- Windows are single-pane with aluminum frames.
- Construction is 2x4 wood framing.
- The wall and rim joist insulation is fairly low with approximately R-11 plus.

The *Baseline Study*² results show that the average window is an aluminum frame window with both 0.65 U-Value and Solar Heat Gain Coefficient. These windows are on average fairly well distributed by orientation, but slightly more windows on the north and south orientations than the east and west orientations.

Window area accounts for approximately 15% of the total wall area for the average home, yet solar heat gain through windows typically accounts for up to 50% of the air conditioning work load. This heat gain can account for 1,400 kWh and 2,200 kWh per year of electricity used to cool indoor air heated by solar gain in the typical home.

In general, exterior walls are wood framed and poorly insulated, or constructed with masonry or block. Combining this structural detail with poor window performance, the total exterior wall system can greatly contribute toward summer cooling costs and occupant comfort. Addressing this issue by replacing windows or making complicated insulation improvements is rarely cost effective for the average home owner. Properly locating deciduous trees on the south, west, and east side of a home can reduce solar heat gain through the exterior wall systems at a relatively low cost to the consumer.

Program Eligibility

- **Workshop Eligibility:**
 - Customers in existing single family residential homes currently served by APS will be able to participate in the APS Shade Tree Workshop at no cost to them.
- **Tree Eligibility:**
 - All customers who participating in the APS Shade Tree Workshop will receive a tree voucher for two free five-gallon trees.
 - Customers who participate in the APS Shade Tree Workshop, and live in a home built before 1980, will receive an additional tree voucher for a total of three five-gallon trees.

² Arizona Public Service Energy Efficiency Baseline Study, September 11, 2006, ICF International.

Attachment 2 Residential Shade Tree Pilot Program

Program Rationale and Objectives

The main objective of the APS Shade Tree Pilot Program is to provide a low cost solution that generates energy and demand savings by reducing air conditioning loads for residential customers. Other benefits of planting shade trees include environmental and community impacts that extend beyond energy savings.

By planting desert adapted trees in proper locations and utilizing proper pruning, shade trees can modify climate and conserve building energy in three ways³:

- Shading – reduces the amount of radiant energy absorbed and stored by built surfaces
- Transpiration – water passes through a tree from the root system into the atmosphere thus cooling the surrounding air
- Wind speed reduction – reduces the infiltration of outside air into interior spaces

Urban forestry, in addition to energy savings⁴, offers a number of positive impacts on the environment and community. These benefits include:

- Reduction in storm water runoff
- Reduction in sulfur dioxide, nitrogen dioxide, ozone, carbon dioxide, and particulate matter in the atmosphere
- Sequestration of carbon dioxide
- Benefit for indigenous wildlife
- Neighborhood and community beautification

By planting carefully selected tree species and educating homeowners in proper planting and maintenance techniques, the Shade Tree Pilot Program can provide a measureable impact in both energy efficiency and other environmental benefits.

Program Implementation

APS will use a community education approach for the Shade Tree Pilot Program. APS will work with a local non-profit organization to provide shade tree planting workshops for participating customers. The goal is to develop an effective curriculum based on the APS *Right Tree, Right Place* outreach program. APS will consult with several local

³ Desert Southwest Community Tree Guide: Benefits, Cost, and Strategic Planting, July, 2004, McPherson, Gregory.

⁴ Phoenix Green: Designing a Community Tree Planting Program for Phoenix, AZ, 2009, Western Resource Advocates.

Attachment 2
Residential Shade Tree Pilot Program

experts and agencies to provide comments on the curriculum. At a minimum, APS will pursue comments from local individuals with one or more of the following certifications:

- International Society of Arboriculture (“ISA”) Certified Arborist
- ISA Certified Arborist/Utility Specialist
- ISA Certified Arborist/Municipal Specialist
- ISA Board Certified Master Arborist

The core curriculum will include the following topics:

- Tree selection:
 - Shade tree selection for a desert climate is very important. Trees must be desert adapted and require minimal irrigation. They must be of sufficient size and canopy density to produce shade. If planting on the southern exposed side, trees should be deciduous reducing the effects of winter heat gain. In addition, they should produce a low amount of allergens and have little to no thorns to help increase home owner acceptance.
 - The two most common species that fit this description are Mesquite and Palo Verde varieties. The free trees available in the APS program will be restricted to these species. However, APS feels it is important to educate customers in tree selection strategies to improve the effectiveness of future tree purchases.
- Tree Planting:
 - Customers will be taught proper tree planting techniques to maximize survivability.
- Planting Locations:
 - For shade purposes, trees will need to be planted approximately 15 feet away from the home and on the east, west, and south sides.
 - Planting in front of window and away from patios and major overhangs will further increase the energy savings potential.
 - Customers will also learn how to plant the proper distance from power lines and how to identify underground utilities.

Attachment 2 Residential Shade Tree Pilot Program

- Tree Maintenance:
 - Customers will be taught how to prune trees to encourage growth and proper tree health. Because it is important allow solar gain during the winter months, customers will also learn pruning techniques to improve seasonal performance.
 - Proper irrigation strategies will be taught to encourage tree growth while minimizing excess water usage.
- Fire Control:
 - APS feels it is important to reinforce lawn maintenance techniques that minimize potential fire hazards. Customers will learn proper shrub and tree trimming techniques, and safe disposal techniques for these trimmings.

In order to ensure the long term success of a Shade Tree Program, homeowners will need a better understanding planting techniques for energy efficiency and tree care. Through the APS sponsored tree planting workshops, homeowners will receive the tools they need to maximize a tree's shade potential and improve the long term survivability of trees planted.

Incentive Design

APS will provide eligible participating customers with the following:

- All customers participating in the APS Shade Tree Workshop will receive a tree voucher for two free five-gallon trees to be planted at homes constructed after 1980.
- Customers who participate in the APS Shade Tree Workshop, and live in a home constructed prior to 1980, will receive an additional tree voucher for a total of three free five-gallon trees.

Delivery Strategy and Administration

APS will work with a local non-profit organization (the "Selected Organization"), similar to *Trees for Tucson* (the agency that implements Tucson Electric Power Company's ("TEP's") current Shade Trees Program), to deliver this program. At this time, APS is in the final stages of selecting an organization to implement this program. The Selected Organization will work closely with APS to develop a training curriculum based on the *Right Tree, Right Place* training currently being used by the Arizona Community Tree Council.

<p>Attachment 2 Residential Shade Tree Pilot Program</p>
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The Selected Organization will conduct regular shade tree workshops throughout the Phoenix metro area. These workshops will be conducted as follows:

- APS customers can present their utility bill at the time of the workshop and attend the course free of charge. Non-APS customers will be able to participate in these workshops, but will pay a nominal fee.
- Customers will receive an educational packet at the workshop including planting, irrigation, maintenance, and other information.
- During the workshop, a member of the organization will print out an aerial shot of the customer's home from Google Earth and highlight optimal planting zones on the south, east and west sides of the home. Additionally, the customer will receive a brief verbal explanation to ensure the customer understands the proper planting locations.
- Upon completion of the workshop, APS customers will receive a voucher for two free five-gallon trees (Mesquite or Palo Verde). An additional free tree voucher will be awarded to customers with homes built prior to 1980 to compensate for further energy inefficiencies inherent to older building code construction. The age of the home will be verified using the Maricopa County Assessor's webpage.
- Prior to receiving the free tree vouchers, customers will sign a participation form that includes:
 - Customer name
 - Customer address
 - Customer phone number
 - Certificate of workshop completion stamp
 - Signature to agree to plant in the shade zones identified on their map

The Selected Organization will host several tree pickup events in which participating customers can redeem tree vouchers. These events will be held mostly in the spring and fall at the height of the planting season. As part of the pilot program, APS will reach out to retail nurseries as possible locations for redeeming tree vouchers. This delivery method will be tested for cost-effectiveness as a part of the pilot program.

Redeemed vouchers and participation forms will be presented to APS by the Selected Organization on a monthly basis for tracking and administrative purposes. APS will then reimburse the Selected Organization for workshop scholarships and tree incentives.

<p>Attachment 2 Residential Shade Tree Pilot Program</p>
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Program delivery will proceed in four phases as follows:

Phase 1: Pilot

A pilot version of the program will be designed and delivered in the Phoenix metro area where the program concept will be tested.

Phase 2: Refinement

A third party will conduct an evaluation of the pilot program. This evaluation will assess the percentage of trees that were planted in the correct locations, first year survival rates and growth characteristics. Pilot results will be analyzed and the program design will be refined according to those findings.

Phase 3: Market Expansion

If the evaluation of the pilot program demonstrates that trees are being planted in the proper locations and have growth characteristics that would lead to long-term survivability of shade producing trees, APS will propose to expand the program throughout the its service territory.

Phase 4: Evaluate

Ongoing evaluation will be conducted to verify savings and continually refine the program delivery.

How to Leverage with Existing Programs

The Shade Tree Pilot Program will be marketed to participants in other DSM programs in the following ways:

- Participants in the Residential HVAC program and the Home Performance with ENERGY STAR[®] program will be presented with information on the Shade Tree Pilot Program as a way to lower future cooling load during the summer months.
- APS will consider leaving behind marketing material for customers participating in the Refrigerator Recycling Program.

Marketing and Communications

The marketing strategy will include the following components:

- Promotions on the APS website
- Developing marketing pieces including brochures and other collateral pieces such as bill inserts
- Call center referrals

<p>Attachment 2 Residential Shade Tree Pilot Program</p>

- APS online energy audit - recommend on-site audits if customers want to proceed further in analysis
- Implementation contractor marketing efforts
- Assistance with responding to customer inquiries about the program
- Community event outreach

Program Implementation Schedule

- APS estimates that the Shade Tree Pilot Program could start within six to eight weeks of receiving Commission approval.
- The planned pilot phase of the program would be implemented for 12 months, January through December 2011. Throughout the pilot phase, measurement and evaluation will be ongoing to track customer participation and tree planting results.
- At the conclusion of the 12 month pilot phase, APS will submit a measurement, evaluation and research “(MER)” report to the Commission to document program savings achieved, and suggested next steps for program redesign, and/or expansion.
- If the evaluation report finds that the pilot program produced cost effective delivery of properly planted shade trees, APS would propose to continue and expand the program in the following year pending Commission action on program approval beyond the pilot phase.

Measurement, Evaluation and Research Plan

APS will develop a MER research plan and conduct annual evaluation research on the achievements of this program. Throughout the pilot phase, onsite evaluations will assess the percentage of trees that were planted in the correct locations, first year survival rates and growth characteristics.

Program Budget

Table 1 - 2011 Shade Tree Pilot Program Budget

	2011
Incentives	\$50,000
Delivery Costs	\$394,000
Incentives as % of Budget	11%
Total Budget	\$444,000

Attachment 2
Residential Shade Tree Pilot Program

Estimated Energy Savings

The energy savings resulting from shade trees varies over its lifetime due to time-dependent factors such as growth and tree mortality rate. For instance, a shade tree program may only produce 14 kWh per tree in savings in year one, compared to 240 kWh per tree in year 14 when the tree is fully grown. It is recommended that an annual levelized savings be claimed for each shade tree that accounts for these time-dependent variables, as well as the time-value of those savings, representing the annual net present savings for the lifetime of the tree. Although this overstates savings in the early years, it will understate savings in the later years, ultimately presenting the same net present value of benefits. This approach is consistent with the method by which savings are claimed by the TEP's Shade Tree program.

The analysis of savings is based on energy simulations of a 1,800 square foot home with 2x4 wood framing, R-17 wall insulation, R-30 attic insulation, and single pane aluminum frame windows. Multiple variations of the model considered the potential impacts of orientation and overhangs. The table below shows the expected participation rate for 2011 and annual levelized energy savings:

Table 2 - Shade Tree Pilot Program Net Levelized Annual Energy Savings

2011 Pilot	
Number of expected trees planted	5,000
Coincident peak demand levelized savings (kW) per tree (Average including line losses and reserve margin)	.09
Annual levelized energy savings (kWh) per tree (Average including line losses)	129
Annual levelized energy savings (MWh)	643

In addition to the savings shown in Table 2, it is estimated that the program will produce the following environmental benefits shown in Table 3.

The projected environmental benefits provided in Table 3 are based on savings from the air emission and water consumption of the generation facility that may be avoided due to this EE pilot program.

Table 3 - 2011 Projected Environmental Benefits

Utility Water Savings	6,000,000 Gallons
SO _x	86 Lbs
NO _x	1,632 Lbs
CO ₂	17,000,000 Lbs

**Attachment 2
Residential Shade Tree Pilot Program**

It is estimated that the average tree will require 1,000 gallons⁵ of irrigation water per year during its establishment period (3-5 years). After a tree is established, desert adapted tree species used in this program will not require irrigation water. To account for watering cost, APS has calculated total water usage during the establishment period valued at \$0.004 per gallon⁶. This cost is factored into the Societal Cost Test for the Shade Tree Pilot Program by subtracting total irrigation costs out of the societal benefits calculation.

In addition to the environmental benefits of avoided emissions, APS recognizes that the planting of shade trees can reduce sulfur dioxide, nitrogen dioxide, ozone, carbon dioxide, and particulate matter in the atmosphere. At this time, APS has not quantified these additional environmental benefits.

Program Cost Effectiveness

The cost effectiveness of the program as a whole was assessed using the Societal Cost Test. Measure analysis worksheets showing all energy savings, cost and cost-effectiveness calculations are included in Appendix 1 and 2 to this document.

The cost effectiveness analysis requires estimation of:

- Net demand and energy savings attributable to the program
- Program implementation costs
- APS's program administration costs
- Present value of program benefits including APS avoided costs over the life of the measures

Table 4 provides a summary of the benefit/cost analysis results for this program. A detailed benefit/cost analysis is presented in Appendix 2.

Table 4 - Benefit-Cost Analysis Results

Cost Effectiveness Tests	SCT
Benefit/Cost Ratio	1.6

Assumptions and financial data are provided in Table 5 below.

⁵ Desert Southwest Community Tree Guide: Benefits, Cost, and Strategic Planting, July, 2004, McPherson, Gregory

⁶ This calculation is a seasonal weighted average based on City of Phoenix potable water rates in effect May 2010.

Attachment 2
Residential Shade Tree Pilot Program

Table 5 - Other Financial Assumptions

Conservation Life (yrs):	30 years
Ratio of Non-Incentive to Incentive Costs	7.9
Social Discount Rate	3.72%

Attachment 2
Residential Shade Tree Pilot Program

Appendix 1 – Residential Shade Tree Pilot Program Energy Savings

DSM Estimated Energy Savings 2011 - Proposed Residential Shade Tree Pilot Program									
Program	Measure	Coincident Demand Savings per Unit (kW)	Annual Energy Savings per Unit (kWh)	NTG Adjustment Factor	TOTAL Savings (kW)	Measure Life (yrs)	TOTAL Lifetime Savings (kWh)	Annual Savings 2011 (kWh)	
Residential Shade Tree Pilot	Shade Trees	0.09	129	1.00	430	30	19,298,161	643,272	
Total					430		19,298,161	643,272	

Where:

"Program" = Residential Conservation Behavior Pilot Program
 "Measure" = DSM measure = Customized home conservation reports
 "Coincident Demand kW Savings per Unit" = Coincident Peak kW savings including line losses and reserve margin
 "Annual Energy" = kWh savings/home/year including line losses
 "Unit" = APS estimate of expected participation in 2011
 "NTG Adjust Factor" = Net to Gross Ratio = factor to account for free riders
 "Total Savings (kW)" = Total estimated demand savings from participating customers attributed to this program
 "Measure life" - Expected lifetime of the measure - based on DEER database and other national sources
 "Total Lifetime Savings (kWh)" = Estimated total energy savings over the expected life of measures
 "Annual Savings (kWh)" = Estimated annual energy savings from participating homes in 2011

Attachment 2
Residential Shade Tree Pilot Program

Appendix 2 – Residential Shade Tree Pilot Program Net Benefits

Net Benefits 2011 - Proposed Residential Shade Tree Pilot Program									
Measure	Avoided cost savings per unit	Customer Incremental Cost per Unit	PA Costs per Unit	SCT Costs per Unit	Units	Total SCT Benefits	Total SCT Costs	SCT Net Benefits	SCT Benefit/Cost
Shade Trees	\$312.09	\$117.05	\$78.80	\$195.85	5,000	\$1,560,470	\$979,250	\$581,220	1.6
Total					5,000	\$1,560,470	\$979,250	\$581,220	

Where:
 "PA Costs" = Program Administrator costs (also referred to as Non-Incentive costs)
 "SCT" = Societal Cost Test

Attachment 3

ATTACHMENT 3

ARIZONA PUBLIC SERVICE COMPANY
 DEMAND SIDE MANAGEMENT PROGRAM

TRUE-UP PERIOD - PROGRAM YEARS 2007 AND 2008
 DSMAC REVENUE

Line No.	(A) True-Up Period DSMAC Revenue for April 2009 - February 2010 ¹	Total \$
1		17,113,607

¹Recovery period is April 2009-February 2010 for costs associated with the 2007 and 2008 program year

ATTACHMENT 3

ARIZONA PUBLIC SERVICE COMPANY
 DEMAND SIDE MANAGEMENT PROGRAM

TRUE-UP PERIOD - PROGRAM YEARS 2007 AND 2008
 DSMAC REVENUE

Line No.	Program	(A) True-Up Period Program Costs for 2007 and 2008 ¹	(B) Forecast Period Program Costs Forecast for 1/3 of 2009 and all of 2011 ²
1	Energy Efficiency (EE) Program Costs (PC)	\$ 17,472,707	\$ 50,152,000
2	2009 Recoverable DSM Program Costs ³	N/A	\$ 5,332,979
3	Performance Incentives (PI) ⁴	-	\$ 8,421,000
4	Sub Total	\$ 17,472,707	\$ 63,905,979
5	Demand Response (DR) PC ⁵	-	\$ 10,620,000
6	Total	\$ 17,472,707	\$ 74,525,979

¹This was the total recoverable program cost for 2008 and a carryover of a portion of 2007 costs

²This is the forecast cost for EE PC, PI, and DR PC based on 1/3 of the 2009 actual costs and the full 2011 Implementation Plan less the \$10M to be collected in 2011 base rates

³\$26,000,290 actual recoverable PC and PI in 2009 program year less \$10M in base rates and \$5,334,333 the 2009 carryover in current DSMAC divided by two years

⁴EE PI is calculated on total PC including PI; PI is 14% in 2011 per the Settlement Agreement approved in Decision 71448

⁵Includes a revision of the 2010 budget of \$808,559

ATTACHMENT 3

ARIZONA PUBLIC SERVICE COMPANY
 DEMAND SIDE MANAGEMENT PROGRAM

TRUE-UP PERIOD - PROGRAM YEARS 2007 AND 2008
 DSMAC REVENUE

Line No.	Date Period	Cost, Collection and Interest	Reference	Amount
1	April 2009 - February 2010	DSMAC Revenue - TU	Schedule 1, Line 1, Column A	\$ 17,113,607
2	January 2007 - December 2009	DSMAC Program Costs - TU	Schedule 2, Line 6, Column A	\$ 17,472,707
3		Sub Total ¹	(Line 1 - Line 2)	\$ (359,100)
4	Treasury constant maturities rate 1/4/2010	Interest = 0.45% ²	(Line 3 * Interest Rate)	\$ -
5		Total TU Balance Account	(Line 3 + Line 4)	\$ <u>(359,100)</u>

¹Under recovery primarily due to delay in implementing DSMAC by 1 month in 2010

²No interest accrues on under recovered amounts

ATTACHMENT 3

ARIZONA PUBLIC SERVICE COMPANY
 DEMAND SIDE MANAGEMENT PROGRAM

TRUE-UP PERIOD - PROGRAM YEARS 2007 AND 2008
 DSMAC REVENUE

Line No.	DSMAC Calculations	Reference	Amount	Units
1	Program forecast costs for adjutor period in 2011	Schedule 2, Line 6, Column B	\$ 74,525,979	
2A	Recovery of True-Up Account (over) under collection	Schedule 3, Line 5	\$ 359,100	
2B	Credit for Gains from Asset Sales (over) under collection ¹		\$ (118,079)	
3	Total amount to be collected	(Line 1 + Line 2)	\$ 74,767,000	
4	Forecast retail kWh sales for adjutor period ²		27,755,088,000 kWh	
5	Proposed kWh adjutor charge for adjutor period ³	(Line 3 / Line 4)	\$ 0.002694	per kWh
6	Forecast General Service kWh sales for adjutor period ⁴		13,380,744,000 kWh	
7	Amount to be collected from General Service demand metered customers for adjutor period	(Line 5 * Line 6)	\$ 36,047,724	
8	Forecast General Service demand billed customer kW		37,538,000 kW	
9	Proposed kW adjutor charge for forecast period ⁵	(Line 7 / Line 8)	\$ 0.960	per kW

¹Credit for certain gains from the sale of APS property per the Commission's action of May 26, 2010

²Forecast retail kWh sales excludes E-3 and E-4 kWh

³\$/kWh charge for all Residential customers and General Service customers with no demand charge

⁴Forecast General Service kWh for customers with demand charges

⁵\$/kW charge for General Service customers with demand charges



ADJUSTMENT SCHEDULE DSMAC-1
DEMAND SIDE MANAGEMENT COST ADJUSTMENT

APPLICATION

The Demand Side Management Adjustment Charge ("DSMAC") shall be applied monthly to every metered and/or non-metered retail Standard Offer or Direct Access service with the exception of customers served on rate schedules E-3 and E-4, and Solar-2. All provisions of the customer's currently applicable rate schedule will apply in addition to this adjustment charge. The DSMAC is applied to Standard Offer or Direct Access customer's bills as monthly charge to recover the cost of Commission approved demand side management programs above those costs included in base rates. The DSMAC will be changed in billing cycle 1 of the March revenue month and will not be prorated. The DSMAC and the RES adjustors may be combined on the customer's bill and appear on the "Environmental Benefits Surcharge" line. Details of how the DSMAC is derived and administered can be found in the Demand Side Management Adjustment Charge Plan for Administration.

RATE

The charge shall be calculated at the following rate:

For all residential customers and general service customers whose billing does not include demand charges:

All kWh \$0.001646002694 per kWh

For general service customers whose billing includes demand charges:

All metered kW \$0.720083960 per kW

SELF DIRECTION

Self direction of DSM charges collected through base rates and Adjustment Schedule DSMAC-1 shall be available for customers who use more than 40 million kWh per year, based on an aggregation of the usage for all the customer's accounts for the January through December billing months in the year the request for self direction is made.

Qualifying customers who elect to self direct their DSM charges must notify APS on or before December 1st in each year that they wish to self direct. Upon such notification, and verification of eligibility by APS, 85% of the customer's DSM charges paid over the January through December billing months in the election year will be reserved for tracking purposes for the customer's eligible energy efficiency project(s) to be completed within two years. The remaining 15% will be retained to cover the self direction program administration, management and verification, measurement and evaluation, and low-income program costs.

Customers who elect to self direct must continue to pay the DSM charges in base rates and Adjustment Schedule DSMAC-1.

Self direction shall be provided in accordance with the Self Direction Provisions approved in Arizona Corporation Commission (Commission) Decision No. 71448, Attachment C to the Settlement Agreement as modified from time to time with Commission approval.

Self direction amounts shall be the DSMAC-1 charges billed over the election year plus the DSM charges recovered in base rates. The latter shall be calculated by multiplying the kWh billed for the System Benefits Charge in the customer's current applicable rate schedule multiplied by \$0.000359 per kWh.

ARIZONA PUBLIC SERVICE COMPANY
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Title: Manager, Regulation and Pricing
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