MEMORANDUM

Date: February 10, 2015

To: The Honorable Chair and Members
Pima County Board of Supervisors

From: C.H. Huckelberry
County Administrator

Re: **Reports on Energy Cost Savings Using Both Renewable (Solar) Supplies and Various Demand Modifications**

Through the collaborative efforts of staff working in multiple departments to implement the renewable energy initiatives outlined in the Sustainable Action Plan for County Operations, Pima County has realized tremendous benefits through the expansion of its renewable energy portfolio from zero to 9.6 Megawatts (since 2009). These efforts have not only served to benefit the County and its residents through conserving an estimated 9,402,796 gallons of water and avoiding 14,990 Metric Tons of CO2e emissions, but they have also and importantly provided positive economic impacts.

Since 2009, the County's renewable energy efforts have helped to create an estimated 1,087 local jobs and save $1,905,092 of taxpayer money. Combined with the four currently planned projects, solar energy will save taxpayers an additional estimated $17.8 million over the next 10 years; a nearly $20 million combined benefit. Furthermore, savings could be increased to an estimated $338 million over 20 years if the Arizona Corporation Commission's current Net Metering rules were changed to allow Aggregated Net Metering.

In addition to the County's solar projects, an audit conducted by Cost Control Associates (CCA) on behalf of the County's Facilities Management Department revealed even more savings if nine of the County's larger accounts were reassigned to Tucson Electric Power Company's (TEP's) general service demand rate. As a result of these reassignments, the County will save an estimated $497,456 annually in future utility costs and as much as over $5 million in savings over a 10-year period.

The attached reports: the "Pima County 2015 Solar Status Update;" "Brief on the Economic Benefits of Changing from Non-Demand to Demand Utility Metering Rates;" and the Regional Wastewater Reclamation Department's Memorandum regarding "Planned Solar Installations," detail the County's progress in expanding its renewable energy initiative. In addition, future efforts to meet the renewable energy targets outlined in the Board of Supervisor's approved 2014 Sustainable Action Plan, will likely lead to additional economic and environmental benefits for County taxpayers in the immediate future, as well as over the long term.

CHH/mjk
Attachments

c: Linda Mayro, Director, Sustainability and Conservation
Michael Kirk, Director, Facilities Management

Prairie Fire Solar Facility, Pima County

PIMA COUNTY 2015 SOLAR STATUS UPDATE

ECONOMIC & ENVIRONMENTAL BENEFITS OF PRESENT AND FUTURE COUNTY SOLAR PROJECTS

February 3, 2015

Prepared by the Office of Sustainability and Conservation

For C. H. Huckelberry, County Administrator

PIMA COUNTY

SUSTAINABILITY & CONSERVATION

Executive Summary

When the Board of Supervisors unanimously adopted a set of initiatives in 2007 to promote and advance sustainability, this action became the basis for the 2008 Sustainable Action Plan for County Operations, which was renewed and refined in 2014 with the goal of protecting and conserving natural resources and using County financial resources effectively and efficiently. The current Plan identifies nine key sustainability focus areas and directs Pima County departments to work toward integrating sustainability efforts into ongoing operations. Among the nine focus areas, is the goal of advancing "Renewable Energy and Energy Efficiency."

Pima County has made significant progress in increasing the proportion of renewable energy it uses in its operations while optimizing energy efficiency. Since 2009, the County has increased its solar energy portfolio from zero Megawatts to 9.6 Megawatts, enough to meet nearly 11% of its annual electricity consumption. As a result of these projects, the County has saved an estimated $1,905,092[1] in energy costs, avoided 14,990 Metric Tons of CO2e emissions, conserved 9,402,796 gallons of water, and helped to produce 1,087 local jobs[2].

To date, a total of nine Pima County solar projects have been completed, and four more are planned at the present time. All but one of these projects have been installed at no cost to the County through either a Power Purchasing Agreement (PPA) or a Solar Service Agreement (SSA) in which the County receives solar power at a price that is less than or equal to what it is paying Tucson Electric Power Company (TEP) at the time of installation and is fixed for 20 years. The section below details the projected economic and environmental benefits resulting from these projects. Additionally, future projects are discussed along with the increased savings and capacity that can be achieved through a change in the Arizona Corporation Commission's (ACC) net metering rules.

[1] Estimate generated based on the difference between annual electricity rates during 2009-2014 and SSA contract rates (kWh @ Utility Price- kWh @ SSA Price= $ Saved).
[2] Estimate generated using NREL's *Jobs and Economic Development Impact* (JEDI) model.

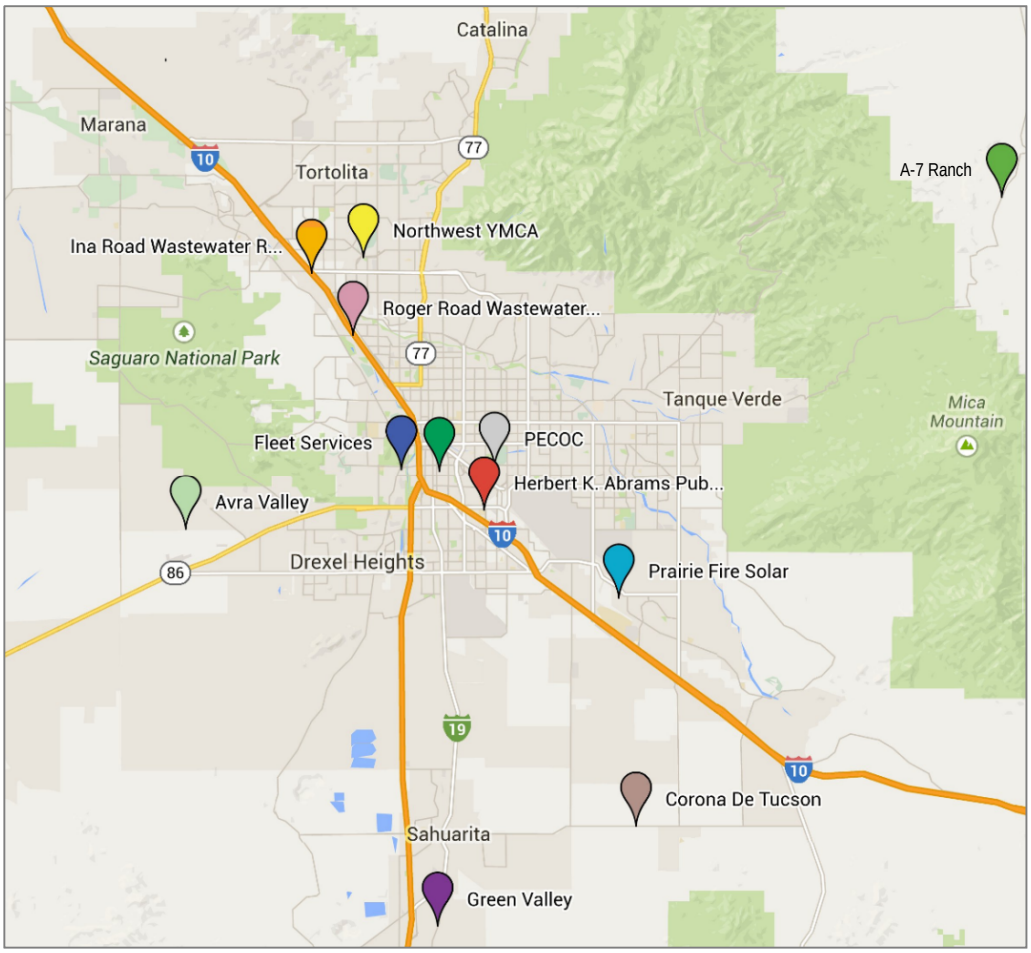

Figure 1. Pima County Solar Facilities

	Site	Address
	A 7 Ranch	Redington Road, Pima County, AZ 85602
	Northwest YMCA	7770 N Shannon Rd, Tucson, AZ 85741
	Ina Road Wastewater Reclamation Facility	7101 N Casa Grande Hwy, Tucson, AZ 85743
	Roger Road Wastewater Reclamation Facility	3035 W El Camino Del Cerro, Tucson, AZ 85750
	Fleet Services	1301 S Mission Rd, Tucson, AZ 85713
	Sullivan Jackson Employment Center	400 E 26th St, Tucson, AZ 85713
	PECOC	3434 E 22nd St, Tucson, AZ 85713
	Herbert K. Abrams Public Health Center	3950 S Country Club Rd, Tucson, AZ 85714
	Avra Valley	10000 W Snyder Hill Rd, Tucson, AZ 85735
	Prairie Fire Solar	7540 E Old Vail Rd, Tucson, AZ 85747
	Corona De Tucson	1100 W Sahuarita Rd, Vail, AZ 85641
	Green Valley	19600 S Old Nogales Hwy, Green Valley, AZ 85614
	Ajo Way Solar Project	To be determined- Not shown on map

SOLAR ENERGY PROJECTS COMPLETED TO DATE (2009-2014)

Sullivan Jackson Employment Center
400 E 26th St, Tucson, AZ 85713

- Financing: Donated by TEP
- On line July 2009
- Capacity: 4.6 kW
- Annual kWh: 7,971.71
- Cost Savings to Date: $ 5,079.93
- Annual Environmental Savings:
    - CO_2e: 15,974.68 lbs.
    - NOx: 11.10 lbs.
    - SO2: 10.85 lbs.
    - Water: 1,992.93 gallons

Roger Road Wastewater Reclamation Facility
3035 W El Camino Del Cerro, Tucson, AZ 85750

- Financing: Solar Service Agreement with Solon America LLC
- On line August 2010
- Capacity: 1 MW
- Annual kWh: 1,927,850 kWh/yr.
- Cost Savings to Date: $ 101,209.18
- Annual Environmental Savings:
    - CO_2e: 3,863,259.68 lbs.
    - NOx: 2,623.23 lbs.
    - SO2: 2,685.11 lbs.
    - Water: 481,962.50 gallons

A-7 Ranch
Redington Road, Pima County, AZ 85602

- Financing: $127,515 EECBG grant
- On line March 2011
- Capacity: 5.6 kW
- Annual kWh: 14,600
- Cost Savings to Date: $6,072.39
- Annual Environmental Savings:
    - CO_2e: 19.87 lbs.
    - NO_x: 19.87 lbs.
    - SO_2: 20.33 lbs.
    - Water: 3,650 gallons

Herbert K. Abrams Public Health Center
3950 S Country Club Rd, Tucson, AZ 85714

- Financing: Solar Service Agreement with Solon America LLC
- On line April 2011
- Capacity: 206 kW
- Annual kWh: 328,682
- Cost Savings to Date: $223,381.97
- Annual Environmental Savings:
    - CO_2e: 658,652.86 lbs.
    - NOx: 447.24 lbs.
    - SO2: 457.79 lbs.
    - Water: 82,170.50 gallons

Ina Road Wastewater Reclamation Facility
7101 N Casa Grande Hwy, Tucson, AZ 85743

- Financing: Power Purchase Agreement with Solon America LLC
- On line April 2011
- Capacity: 1.1 MW
- Annual kWh: 1,771,811
- Cost Savings to Date: $18,020.16
- Annual Environmental Savings:
    - CO_2e: 3,550,569.80 lbs.
    - NOx: 2,410.90 lbs.
    - SO2: 2,467.78 lbs.
    - Water: 442,952.75 gallons

Prairie Fire Solar
7540 E Old Vail Rd, Tucson, AZ 85747

- Financing: Power Purchase Agreement with TEP
- On line December 2012
- Capacity: 5 MW
- Annual kWh: 9,639,250
- Cost Savings to Date: $1,618,453.64
- Annual Environmental Savings:
    - CO_2e: 19,316,298.39 lbs.
    - NO_x: 13,425.55 lbs.
    - SO_2: 13,116.13 lbs.
    - Water: 2,409,812.50 gallons

SOLAR PROJECTS COMMISSIONED IN 2014

Northwest YMCA
7770 N Shannon Rd, Tucson, AZ 85741

- Financing: Solar Service Agreement with Solon America LLC
- On line June 2014
- Capacity: 588 kW
- Annual kWh: 1,017,000
- Cost Savings: More than $1,000,000 over the next 25 Years
- Annual Environmental Savings:
  - CO_2e: 2,037,987.9 lbs.
  - NO_x: 1,383.83 lbs.
  - SO_2: 1,416.49 lbs.
  - Water: 254,250 gallons

Fleet Services
1301 S Mission Rd, Tucson, AZ 85713

- Financing: Solar Service Agreement with Solon America LLC
- On line October 2014
- Capacity: 607 kW
- Annual kWh: 1,051,919
- Cost Savings: More than $2,000,000 over the next 25 Years
- Provides shade for 240 parking stalls
- Annual Environmental Savings:
  - CO_2e: 2,107,962.89 lbs.
  - NO_x: 1,431.35 lbs.
  - SO_2: 1,465.11 lbs.
  - Water: 262,979.75 gallons

Pima Emergency Communications Operations Center (PECOC)
3434 E 22nd St, Tucson, AZ 85713

- Financing: Solar Service Agreement with Solon America LLC
- On line October 2014
- Capacity: 416 kW
- Annual kWh: 732,274
- Cost Savings: More than $1,000,000 over the next 25 Years
- Provides shade for 152 parking stalls
- Annual Environmental Savings:
  - CO_2e: 1,467,419.47 lbs.
  - NO_x: 996.41 lbs.
  - SO_2: 1,019.91 lbs.
  - Water: 183,068.50 gallons

Figure 2. Solar Net Cost Savings Pima County 2009-2014

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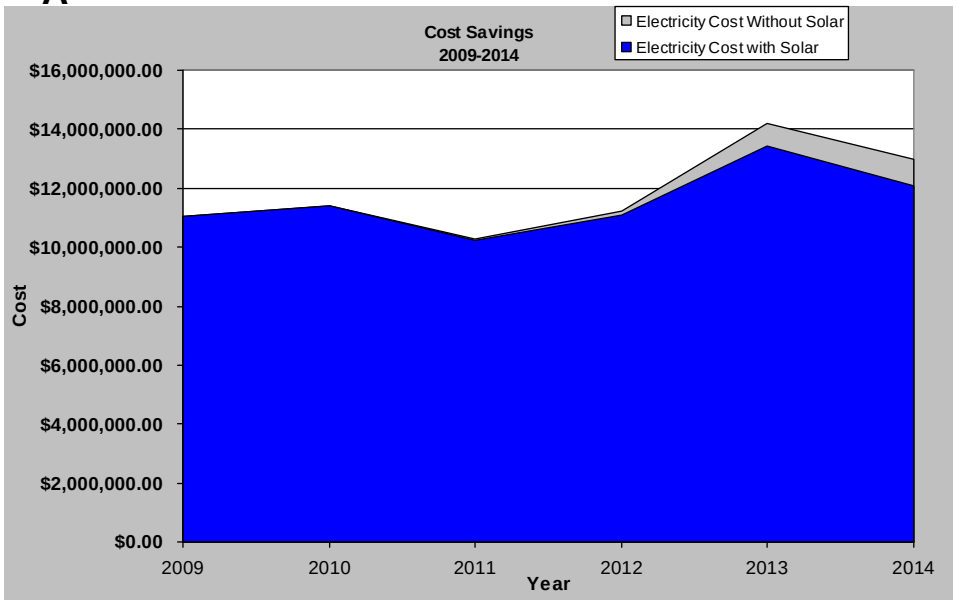

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	Without Solar	With Solar	Savings[3]
2009	$11,053,140.94	$11,052,355.81	**$785.13**
2010	$11,415,910.58	$11,409,307.62	**$6,602.96**
2011	$10,265,022.40	$10,209,471.79	**$55,550.61**
2012	$11,230,342.02	$11,093,514.00	**$136,828.02**
2013	$14,218,598.63	$13,413,140.00	**$805,458.63**
2014	$12,983,101.77	$12,083,235.32	**$899,866.45**
		Total	**$1,905,091.80**

C

				Emissions Avoided to Date (lbs.)[4]		
	Date Installed	**Cost Savings**	**Water (gal.)**	**NOx**	**SO2**	**CO2e**
Sullivan Jackson Employment Center	Jul-09	**$5,079.93**	10,961.10	59.66	61.07	87,860.74
Roger Road WRF	Aug-10	**$101,209.18**	2,128,667.71	11,585.91	11,859.23	17,062,730.25
A-7 Ranch	Mar-11	**$6,072.39**	13,687.50	74.50	76.26	109,714.69
Ina Road WRF	Apr-11	**$223,381.97**	1,624,160.05	8,839.98	9,048.52	13,018,755.71
Herbert K. Abrams Public Health Center	Apr-11	**$18,020.16**	301,291.83	1,639.87	1,678.56	2,415,060.45
Prairie Fire	Dec-12	**$1,618,453.64**	5,020,442.71	27,325.27	27,969.89	40,242,288.31
Northwest YMCA	Jun-14	**NA**	45,767.13	807.24	826.28	1,188,826.31
PECOC	Oct-14	**NA**	148,312.50	249.10	254.98	366,854.87
Fleet Services Building	Oct-14	**NA**	65,744.94	357.84	366.28	526,990.72
	Total:	**$1,972,217.27**	**65,744.94**	**357.84**	**366.28**	**526,990.72**

[3] See equation 1
[4] See equation 3b

SOLAR PROJECTS PLANNED FOR 2015

SOLAR INSTALLATIONS TO BE COMMISSIONED FOR REGIONAL WASTEWATER RECLAMATION FACILITIES IN 2015

Green Valley
19600 S Old Nogales Hwy, Green Valley, AZ 85614

- Financing: Solar Service Agreement with Solon America LLC
- On line: 2015
- Capacity: 1 MW
- Average Annual kWh: 1,755,194
- Total Cost Savings: $3,105,121 over the 20 year contract
- Annual Environmental Savings:
    - CO_2e: 25,111,187.91 lbs.
    - NO_x: 17,050.18 lbs.
    - SO_2: 17,453.21 lbs.
    - Water: 438,798.56 gallons

Avra Valley
10000 W Snyder Hill Rd, Tucson, AZ 85735

- Financing: Solar Service Agreement with Solon America LLC
- On line: 2015
- Capacity: 1 MW
- Average Annual kWh: 1,729,102.95
- Total Cost Savings: $3,585,285 over the 20 year contract
- Annual Environmental Savings:
    - CO_2e: 25,111,187.90 lbs.
    - NO_x: 17,050.97 lbs.
    - SO_2: 17,453.21 lbs.
    - Water: 389,048.16 gallons

Corona De Tucson
1100 W Sahuarita Rd, Vail, AZ 85641

- Financing: Solar Service Agreement with Solon America LLC
- On line: 2015
- Capacity: 500 kW
- Average Annual kWh: 580,521.55
- Total Cost Savings: $1,022,979 over the 20 year contract
- Annual Environmental Savings:
    - CO_2e: 1,163,319.50 lbs.
    - NO_x: 789.91 lbs.
    - SO_2: 808.55 lbs.
    - Water: 145,130.39 gallons

SOLAR PROJECTS PLANNED FOR 2016

Ajo Way Solar Project
Multiple Sites (TBD)

- Financing: Solar Service Agreement with Solon America LLC
- On line 2016
- PV Shade Structures at 12 Sites
- Capacity: 6.5 MW (combined total)
- Average Annual kWh: 12,531,025
- Total Cost Savings: $1,022,979 over the 20 year contract
- Annual Environmental Savings:
    - CO_2e: 1,163,319.50 lbs.
    - NO_x: 789.91 lbs.
    - SO_2: 808.55 lbs.
    - Water: 145,130.39 gallons

Figure 3. Projected Solar Net Cost Savings for Pima County 2009-2025 (over combined lifetime)

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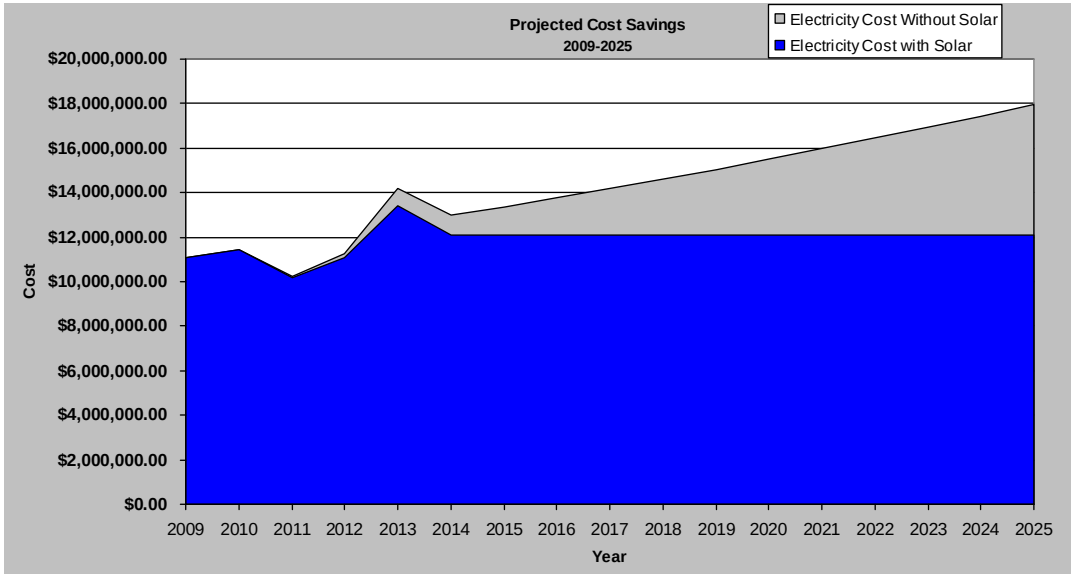

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	Without Solar	With Solar	Savings[5]
2009	$11,053,140.94	$11,052,355.81	**$785.13**
2010	$11,415,910.58	$11,409,307.62	**$6,602.96**
2011	$10,265,022.40	$10,209,471.79	**$55,550.61**
2012	$11,230,342.02	$11,093,514.00	**$136,828.02**
2013	$14,218,598.63	$13,413,140.00	**$805,458.63**
2014	$12,983,101.77	$12,083,235.32	**$899,866.45**
2015	$13,372,594.83	$12,083,235.32	**$1,015,950.83**
2016	$13,773,772.67	$12,083,235.32	**$1,256,315.35**
2017	$14,186,985.85	$12,083,235.32	**$1,348,516.18**
2018	$14,612,595.43	$12,083,235.32	**$1,504,897.93**
2019	$15,050,973.29	$12,083,235.32	**$1,667,534.95**
2020	$15,502,502.49	$12,083,235.32	**$1,836,677.45**
2021	$15,967,577.56	$12,083,235.32	**$1,456,208.14**
2022	$16,446,604.89	$12,083,235.32	**$1,639,152.66**
2023	$16,940,003.04	$12,083,235.32	**$1,829,414.97**
2024	$17,448,203.13	$12,083,235.32	**$2,027,287.77**
2025	$17,971,649.22	$12,083,235.32	**$2,233,075.48**
		Total	**$19,720,123.52**

[5] Projected cost savings estimated based on a 3% per year increase in electricity cost per kWh and assumes no increase in the number of kWh consumed per year after 2014. See equation 2.

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	Date Installed	Cost Savings	Water (gal.)	Emissions Avoided (lbs.)[6]		
				NOx	SO2	CO2e
Sullivan Jackson Employment Center	Jul-09	18,054.82	49,823.19	271.18	277.57	399,366.99
Roger Road WRF	Aug-10	1,206,106.36	12,049,062.50	65,580.64	67,127.74	96,581,491.96
A-7 Ranch	Mar-11	36,438.55	49,823.19	496.66	508.37	731,431.27
Ina Road WRF	Apr-11	1,645,467.21	11,073,818.75	60,272.58	61,694.46	88,764,245.06
Herbert K. Abrams Public Health Center	Apr-11	213,131.31	2,054,262.50	11,180.94	11,444.71	16,466,321.52
Prairie Fire	Dec-12	13,693,260.46	60,245,312.50	327,903.19	335,638.69	482,907,459.78
Northwest YMCA	Jun-14	1,086,972.55	6,356,250.00	34,595.80	35,411.94	50,949,699.05
PECOC	Oct-14	212,490.68	4,576,712.50	24,910.13	25,497.78	36,685,486.65
Fleet Services Building	Oct-14	147,921.47	6,574,493.75	35,783.65	52,699,072.25	6,574,493.75
Green Valley WRF	Jul-15	1,272,245.64	438,798.56	59,707.32	61,115.86	87,931,778.58
Avra Valley WRF	Aug-15	330,159.33	389,048.16	52,937.78	54,186.63	77,962,189.96
Corona De Tucson	Sep-15	298,677.37	145,130.39	19,747.89	20,213.76	29,082,987.48
Ajo Way Solar Project	Jan-16	2,530,748.62	3,132,756.25	426,274.14	436,330.29	627,779,697.71
Total		**$19,315,094.55**	**205,714,319.75**	**1,119,686.90**	**1,146,100.62**	**1,648,941,228.25**

[6] See equations 3a and 3b

CONSTRAINT TO BUILDING MORE SOLAR ELECTRICITY
(A $663 MILLION REDUCTION IN COUNTY ELECTRICITY COSTS)

Pima County's Renewal Energy generation achievements and resulting benefits are impressive and we have the potential and demand to establish more solar facilities and reduce operational costs by more than $663 million over the next 30 years.

However, achieving these savings will require Aggregate Net Metering. Several years ago Pima County actively supported the passage of ACC docket 10-0202 Aggregate Net Metering (ANM) which would enhance the current net metering rules to enable local governments and school districts, funded solely by taxpayers the same persons as ratepayers, to establish solar electric generating facilities on property they own or control on land remote from their urban office loads and credit that energy to their many meters. Current rules require, however, that the generating facility be located on the same contiguous property as the meter(s) it serves, and be interconnected to the grid on the customer side of the meter(s). Without ANM, construction of future County solar projects is constrained since there remain only a few urban County sites suitable for the placement of solar facilities. An alternative for consideration is establishing an Urban Core Micro Grid.

Table 1. Cost Savings Projections* *with* Aggregate Net Metering

	GS-10 $/kWh @3% per year Increase	**Utility Cost for Current usage est. 120,000,000 kWh/year**	**Cost at 2014 SSA Price 120,000,000 kWh @$0.057/kWh**	**Savings**
2014	$ 0.14	$ 16,800,000	$ 6,840,000	$ 9,960,000
2019	$ 0.1623	$ 19,475,804	$ 6,840,000	$ 12,635,804
2024	$ 0.19	$ 22,577,795	$ 6,840,000	$ 15,737,795
2029	$ 0.2181	$ 26,173,853	$ 6,840,000	$ 19,333,853
2034	$ 0.25	$ 30,342,669	$ 6,840,000	$ 23,502,669
			20-year SSA SAVINGS	**$ 338,124,960**
			O & M Cost 2.8c/kWh	
2035	$ 0.26	$ 31,252,949	$ 3,360,000	$ 27,892,949
2044	$ 0.3398	$ 40,778,010	$ 3,360,000	$ 37,418,010
		Last 10-year	**SAVINGS**	**$ 324,680,033**
			Total 30-Year SAVINGS	**$ 662,804,993**

***Assumptions**

1. Allows for a 3% increase/year in TEP energy costs; AZ utilities historically averaged 4.8%/year; 2015 EPA carbon and fuel cost penalties are likely to increase TEP's historical rate increases.
2. Provides that 120,000,000 kWh/year are purchased by Pima County.
3. Assumes that PV has a 30-year life; County establishes O & M contracts at 2.8c/kWh for last 10-years.

Additional Renewable Energy Certificate (REC) Potential Revenues

Each kilowatt-hour (kWh) of renewable energy generates a REC which can be sold on the open market to corporations that fund Green Energy Programs, for example the Department of Defense/Defense Logistics Agency. If Pima County were to generate 80% of its current electricity requirements via solar, 96,000,000 REC's per year would be issued. Over the 30-year life of the solar facilities, that would equate to a total of 2.9 Billion REC's. At current prices ($0.003 to $0.005 per REC) up to $14,400,000 million dollars/year in revenue could be generated through REC sales. Moreover, the value and market for REC's is expected to increase when (if) the EPA releases new carbon thresholds during 2015; carbon generators that exceed their threshold will be assessed a penalty or allowed to purchase REC's to offset excess carbon generation.

Environmental/Water Benefits

If the Aggregate Net Metering Rule were adopted, thereby allowing Pima County to install more solar facilities, multiple benefits could be achieved.

- Fewer greenhouse gas emissions -- (primarily carbon dioxide, nitrous oxide, and methane) which increase average temperatures and result in less precipitation -- would be added to the atmosphere.

- Visible emissions like sulfur and nitrous (acid rain) -- that pose serious human health risks and increase indigenous healthcare costs for the County and for all residents -- would be reduced.

- And, enormous amounts of water being currently lost to evaporation in steam generation or "Brown Power," would be saved.

ANM would provide significant support towards achieving Pima County's Sustainable Action Plan targets to reduce the carbon footprint of County operations and conserve precious potable water.

In fact, if 80% of the County's current electricity were provided by solar (2.9 Billion kWh over 30-years) it would eliminate 3.4 billion lbs. of carbon emissions (1.17 pound/kwh) entering the atmosphere and prevent the loss of 2.1 billion gallons of water (3/4 gallon per kilowatt-hour).[7]

Alternative: TEP-Public Partnership to establish an Urban Core Micro Grid[8]

Pima County would not be compelled to self-generate its electricity if Tucson Electric Power Company (TEP) committed to reducing and controlling energy costs to be competitive with customer self-generation alternatives by implementing new lower cost generation and energy storage technologies.

This could be achieved via a local government partnership project with TEP to establish multiple dispersed utility scale solar electric facilities of sufficient capacity to satisfy Tucson Community energy needs, within/adjacent to existing distribution infrastructure, with circuit/feeder energy storage equipment, essentially an Urban Core Micro Grid (MMG).

SUMMARY

Pima County has made significant progress in transitioning its energy supply to a clean, renewable source and has realized significant benefits as a result. Since 2009, the County has saved more than $1.9 million and by 2025 it will have saved in excess of $16 million dollars. Projects currently in development will save an additional $250,000 annually bringing the annual savings to more than $1 million per year. Although purchasing solar electricity has become cheaper than continuing to purchase conventional power from the grid and aggressively pursuing the development of additional solar resources could save more than $10 million dollars per year, current State regulations prevent the County from doing so. Adopting the Aggregate Net Metering rule would save taxpayers hundreds of millions of dollars in the coming decades while creating jobs and protecting the environment.

[7] The CAP, Modeer, has stated that development of alternative water sources in the future will cost 10 to 50 times more than current costs.

[8] Design to supply renewable energy to Pima County, the City of Tucson, and Downtown Businesses in Tucson.

APPENDIX 1. Methods of Analysis

1.a Data Sources: Specifications for each Pima County Solar facility including, financing method, installation date, kWh production per year, and cost per kWh (if applicable) were obtained from their respective contracts on Pima County's E-Contracts site and through phone and email correspondence with Marc Lynn (Energy Manager), Terry Finefrock (Procurement Division Manager), and Dave Martin (RWRD). Cost savings, emissions reductions and water saved per year were then calculated using the equations and emissions factors in the *Equations* section below.

- ***Net Cost Savings to Date*** were estimated using electricity rates for the corresponding year obtained from several sources.

- ***Projected Cost Savings*** were estimated assuming a conservative 3% per year increase in the cost of electricity per kWh.

- ***Number of Jobs Created*** was estimated using NREL's Jobs and Economic Development Impact (JEDI) model, a tool that estimates the economic impacts of constructing and operating power generation and biofuel plants at the local and state levels. Individual model runs were completed for each solar installation the results of which were then combined together to produce the final figure[2].

1.b Equations (Data sources involved)

1. ***Net Cost Saving***[2,3,4,7,8,9]
   (Utility electricity rate ($/kWh) in year *X*) **x** (kWh purchased in year *X*) **–** (SSA electricity rate ($/kWh) in year *X*) **x** (kWh purchased in year *X*)

   Projected Cost Savings[2,6a-6,9]
2. (Utility electricity rate ($/kWh) in year *X+3% annual increase*) **x** (kWh purchased in year *X*) **–** (SSA electricity rate ($/kWh) in year *X*) **x** (kWh purchased in year *X*)

3. ***Emissions and Water Avoided***[1,2,6a-6i]
   a. Emissions in lbs/Year = (kWh generated/year) **x** (Emissions Factor)
      Water in gallons/Year = (kWh generated/year) **x** (Emissions Factor)

   b. Emissions in lbs = (kWh generated/year) **x** (Years in operation) **x** (Emissions Factor)
      Water in gallons = (kWh generated/year) **x** (Years in operation) **x** (Emissions Factor)

APPENDIX 2. References and Data Sources

1. Environmental Protection Agency. (2014). *eGRID 9th edition Version 1.0*. Retrieved from http://www.epa.gov/cleanenergy/documents/egridzips/eGRID_9th_edition_V1_0_year_2010.zip

2. Memorandum. *SOLON Corporation 10 Kilowatt Solar Facility Donation.* Date: August 9, 2010. To: Reid Spaulding, Facilities Management Department Director From: C.H. Huckelberry. Pima County Board of Supervisors County Admini.

3. Pima County. (2009). *Roger Road WRF - Preliminary Solar Power Economic Analysis*.

4. Pima County. (2010). *TEP Community Solar Tariff Economic Evaluation- 5000 kW*.

5. United States. Department of Energy. National Renewable Energy Laboratory (U.S.) United States. Department of Energy. Office of Scientific and Technical Information. (2009). *JEDI: Jobs and Economic Development Impacts Model, National Renewable Energy Laboratory (NREL)* (PV3.24.14.). Retrieved from United States. Dept. of Energy website: http://www.nrel.gov/analysis/jedi/download.html

6. Pima County Contracts
    a. Oak Leaf Contract# 15000000000000000127(Green Valley)
    b. Oak Leaf Contract# 15000000000000000128 (Avara Valley)
    c. Oak Leaf Contract# 15000000000000000129 (Corona De Tucson)
    d. Solon Contract# 15000000000000000113 (Pecoc)
    e. Solon Contract# 14000000000000000355 (Northwest YMCA)
    f. Solon Contract# 12000000000000000499 (Fleet Services)
    g. Solon Contract# 11-13-5-142106-0609 (Roger Road)
    h. Sun Edison Contract# 11-13-S-142732-0609, Amended 11/02/2010 (Abrams and Ina Road)
    i. Tucson Electric Power Contract# 12000000000000000499 (Prairie Fire Solar**)**

7. EnergyCAP. (2012). *General Fund Account: Total cost/ total kWh*.

8. EnergyCAP. (2013). *General Fund Account: Total cost/ total kWh*.

9. EnergyCAP. (2014). *General Fund Account: Total cost/ total kWh*.

APPENDIX 3. Glossary of Terms

Aggregate Net Metering: The practice of allowing one customer who owns a generating asset (using renewable resources, a fuel cell or CHP) and receives service on multiple meters on properties contiguous with the site of the customer's generation asset to aggregate loads from those multiple meters so that the customer's generation can offset kWh purchased from the utility for the aggregated load. *(Arizona Corporation Commission)*

Carbon threshold: Emission thresholds determine when Clean Air Act permits under the New Source Review Prevention of Significant Deterioration (PSD) and Title V Operating Permit programs are required for new and existing industrial facilities. New thresholds would require new and existing industrial facilities to purchase permits if their emissions exceed the threshold. (*U.S. Environmental Protection Agency*)

Kilowatt-hour (kWh): The kilowatt-hour is a standard unit of electricity production and consumption. It refers to the generation or use of electric power (watts) over a period of time. One kilowatt-hour is equivalent to 1000 watts per hour, enough power to 20 watt CFL lightbulb for 50 hours. (*U.S. Department of Energy*)

Photovoltaic (PV): Devices that generate electricity directly from sunlight via an electronic process that occurs naturally in certain types of material, called semiconductors. Electrons in these materials are freed by solar energy and can be induced to travel through an electrical circuit, powering electrical devices or sending electricity to the grid. (*U.S. Department of Energy*)

Renewable Energy Credit (REC): A REC represents the property rights to the environmental, social, and other nonpower qualities of renewable electricity generation. A REC, and its associated attributes and benefits, can be sold separately from the underlying physical electricity associated with a renewable energy. (*U.S. Environmental Protection Agency*)

Solar Service Agreement: Also known as a *Power Purchasing Agreement*, a Solar Service Agreement is a financial agreement where a developer arranges for the design, permitting, financing and installation of a solar energy system on a customer's property at little to no cost. The developer sells the power generated to the host customer at a fixed rate that is typically lower than the local utility's retail rate. This lower electricity price serves to offset the customer's purchase of electricity from the grid while the developer receives the income from these sales of electricity as well as any tax credits and other incentives generated from the system. (*Solar Energy Industries Association*)

PIMA COUNTY 2015 ENERGY COST SAVINGS

ECONOMIC BENEFITS OF CHANGING FROM

NON-DEMAND TO DEMAND UTILITY METERING RATES

January 30, 2015

Prepared by the Facilities Management Division and the Office of Sustainability and Conservation

For C. H. Huckelberry, County Administrator

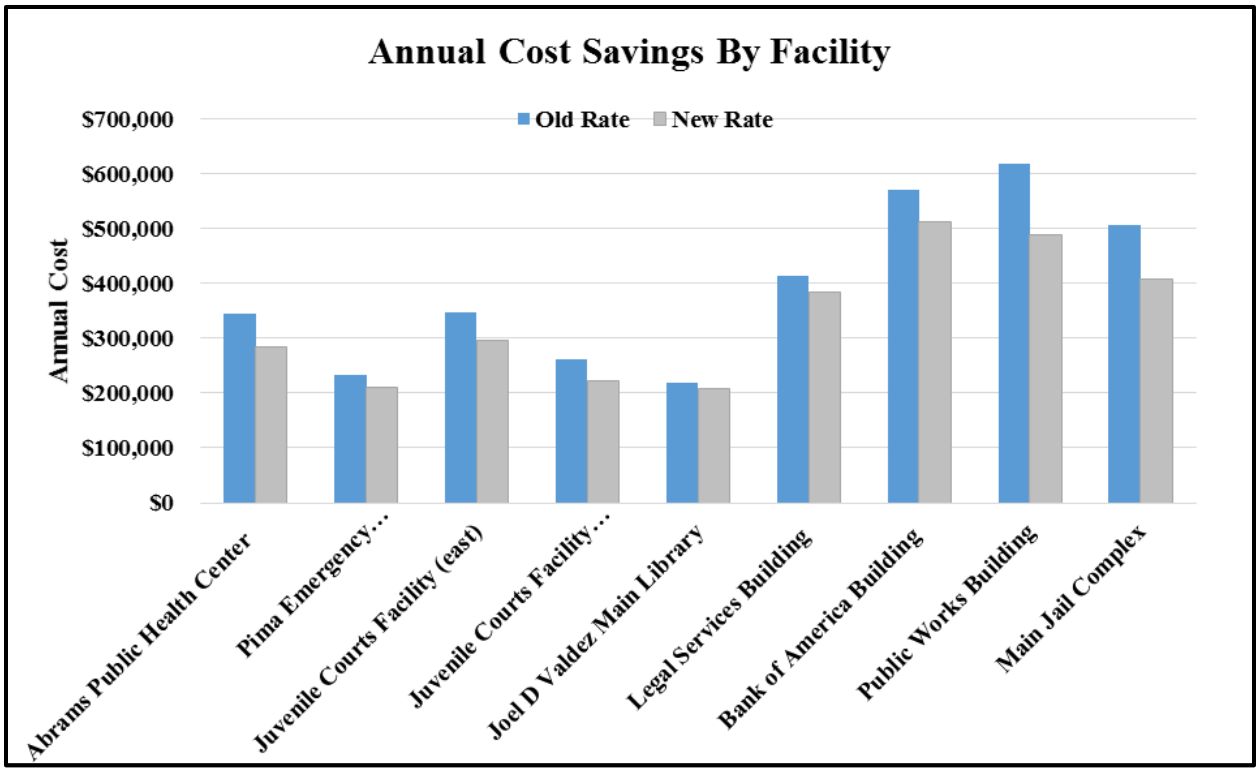
PIMA COUNTY
FACILITIES MANAGEMENT

Executive Summary

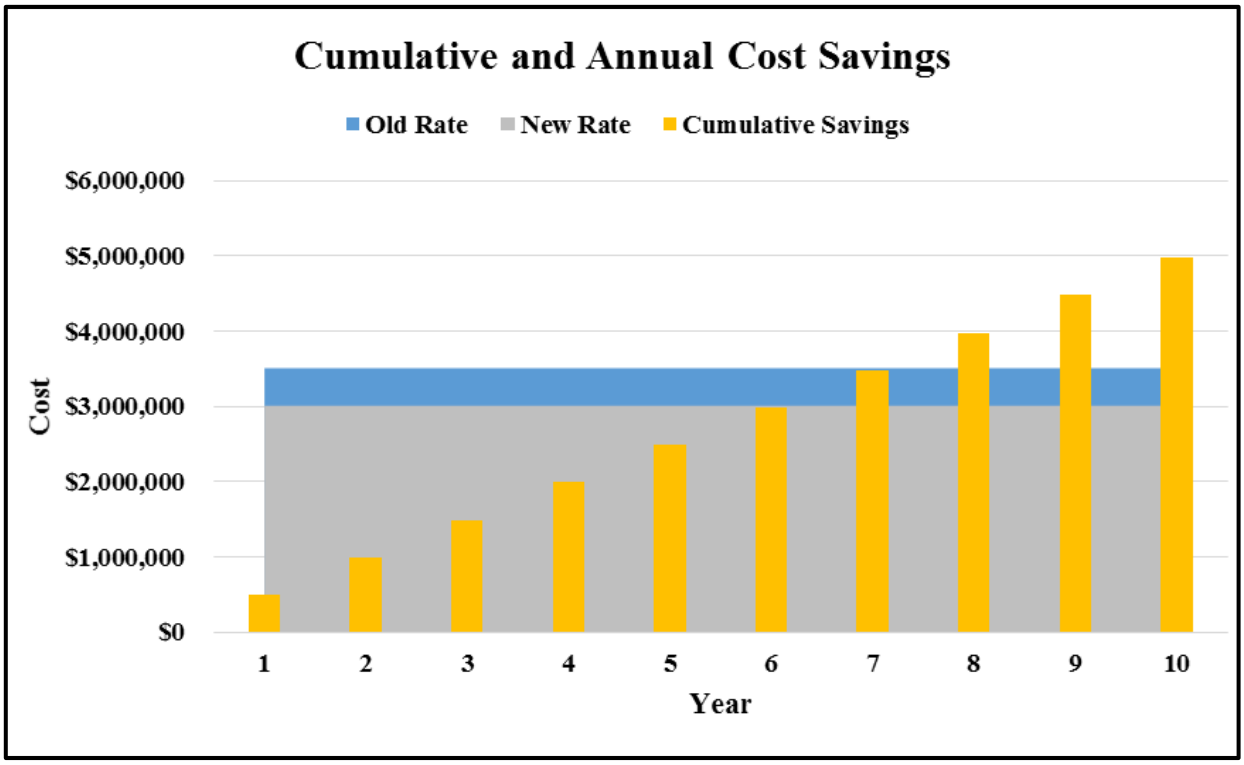
Earlier this year, Pima County's Facilities Management Department (FMD) contracted with Cost Control Associates (CCA) to audit all of the gas, water and electricity utility bills that Pima County receives monthly. These included over 1500 bills a month, from 22 different vendors. In years past, this would have involved the physical copying of each and every invoice and processing the hard copies for analysis. This year however, Facilities Management had the advantage of being able to rely on the newly implemented EnergyCAP utility bill management system. This system allows FMD to create a log in access for CCA through the EnergyCAP vendor hosted website in order to access the County's utility data.

As a result of the 2014 CAA audit, possible annual savings between $36,874.00 and $816,273.00 dollars were identified if some large facilities were reassigned from non-demand to demand rate metering. In order for CCA to determine the exact actual savings, Pima County conducted a pilot to test these assumptions by changing the metering of nine (9) facilities for a three month period beginning June of 2014. By November 14, 2014, CCA completed the review of three months County utility bill data that was based on TEP's demand rate. The results of the pilot demonstrated a projected annual utility cost reduction of $497,456.00 or monthly cost savings of $41,454.70 monthly by switching from TEP's non-demand to a demand rate structure.

Hence, the County authorized the reassignment of nine (9) of our larger accounts to TEP's general service demand rate. Assuming a fixed utility rate (no change over time) over the next ten (10) years, the total projected savings for these reassignments are estimated to be $4,974,563.80. However, assuming a conservative 3% annual utility rate increase, Pima County will save a projected $5,702,779.90 over ten years. The charts and tables below detail the estimated cost savings under each scenario.



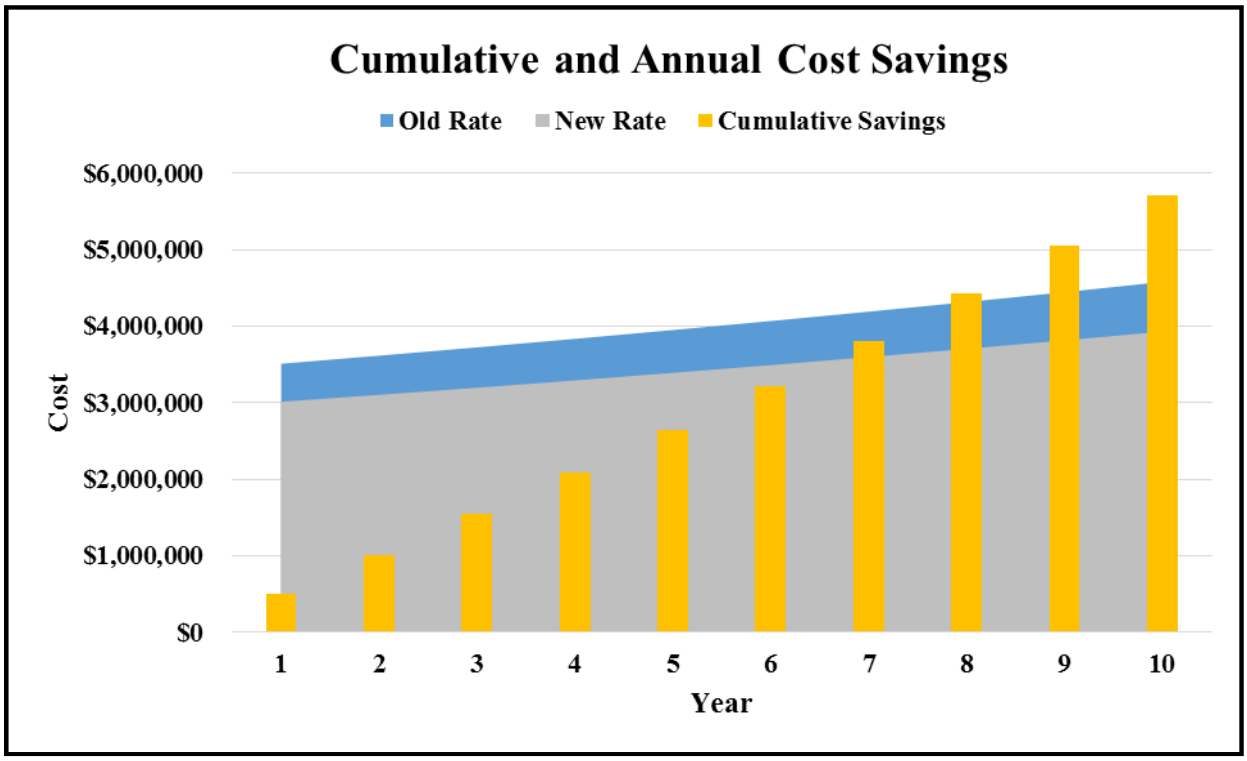
Facility	Old Rate	New Rate	Annual Savings
Abrams Public Health Center	$344,974.43	$283,188.76	$61,785.67
Pima Emergency Communications and Operations Center	$233,394.29	$210,810.67	$22,583.62
Juvenile Courts Facility (east)	$346,198.53	$295,164.97	$51,033.56
Juvenile Courts Facility (west)	$260,642.84	$221,799.22	$38,843.62
Joel D Valdez Main Library	$217,877.07	$208,692.91	$9,184.16
Legal Services Building	$414,451.64	$384,157.44	$30,294.20
Bank of America Building	$569,707.03	$512,808.32	$56,898.71
Public Works Building	$617,313.57	$488,370.77	$128,942.80
Main Jail Complex	$505,702.27	$407,812.23	$97,890.04
Total	**$3,510,261.67**	**$3,012,805.29**	**$497,456.38**



Year	Old Rate	New Rate	Annual Savings	Cumulative Savings
1	$3,510,261.67	$3,012,805.29	$497,456.38	$497,456.38
2	$3,510,261.67	$3,012,805.29	$497,456.38	$994,912.76
3	$3,510,261.67	$3,012,805.29	$497,456.38	$1,492,369.14
4	$3,510,261.67	$3,012,805.29	$497,456.38	$1,989,825.52
5	$3,510,261.67	$3,012,805.29	$497,456.38	$2,487,281.90
6	$3,510,261.67	$3,012,805.29	$497,456.38	$2,984,738.28
7	$3,510,261.67	$3,012,805.29	$497,456.38	$3,482,194.66
8	$3,510,261.67	$3,012,805.29	$497,456.38	$3,979,651.04
9	$3,510,261.67	$3,012,805.29	$497,456.38	$4,477,107.42
10	$3,510,261.67	$3,012,805.29	$497,456.38	$4,974,563.80

***Assumes the following:**

- Consumption and demand levels remain consistent with 2014.
- TEP both rates remain fixed.



Year	Old Rate	New Rate	Annual Savings	Cumulative Savings
1	$3,510,261.67	$3,012,805.29	$497,456.38	$497,456.38
2	$3,615,569.52	$3,103,189.45	$512,380.07	$1,009,836.45
3	$3,724,036.61	$3,196,285.13	$527,751.47	$1,537,587.92
4	$3,835,757.70	$3,292,173.69	$543,584.02	$2,081,171.94
5	$3,950,830.43	$3,390,938.90	$559,891.54	$2,641,063.48
6	$4,069,355.35	$3,492,667.06	$576,688.28	$3,217,751.77
7	$4,191,436.01	$3,597,447.08	$593,988.93	$3,811,740.70
8	$4,317,179.09	$3,705,370.49	$611,808.60	$4,423,549.30
9	$4,446,694.46	$3,816,531.60	$630,162.86	$5,053,712.16
10	$4,580,095.30	$3,931,027.55	$649,067.74	$5,702,779.90

***Assumes the following:**

- Consumption and demand levels remain consistent with 2014.
- 3% annual increase for both rates.

Summary

Through the data provided by the CAA utility bill audits and the utilization of a utility bill management system (EnergyCap), Pima County has recognized significant annual cost savings of $497,456.38. In combination with existing and planned renewable energy facilities installations, the County is on a path to improve long-term savings for tax payers and improve environmental quality by reducing greenhouse gas emissions.

PIMA COUNTY
REGIONAL WASTEWATER RECLAMATION DEPARTMENT
201 NORTH STONE AVENUE
TUCSON, ARIZONA 85701-1207

JACKSON JENKINS
DIRECTOR

PH: (520) 724-6500
FAX: (520) 724-9635

February 2, 2015

To: Linda Mayro, Director, Pima County Office of Sustainability and Conservation
From: Jackson Jenkins, Director – Regional Wastewater Reclamation Department (RWRD)
Subject: **RWRD to Maximize the Use of Solar Power at its Sub-regional Facilities: Avra Valley, Corona de Tucson and Green Valley WRF's**

With the passage of the *Sustainable Action Plan for County Operations* by Resolution No. 2007-84, on May 1, 2007, and the succeeding *Sustainable Action Plan* by Resolution No. 2014 – 63 on June 17, 2014, the Pima County Board of Supervisors is committed to creating and maintaining a sustainable community that promotes sound resource conservation and stewardship. Two (2) of the key elements of this resolution are:

- Adhering to the Renewable Energy Standard adopted by the Arizona Corporation Commission such that fifteen percent (15%) of all County facilities' electrical energy consumption shall be generated from renewable resources by 2025 and,
- Increase the use of solar energy by 4 million kWh by June 30, FY 2018/19.

Energy Management is a major component of RWRD's Integrated Sustainability and Resource Recovery Program (The Sustainability Program). RWRD spends approximately $6 M per year on energy. One important goal of RWRD's Sustainability Program is to maximize the use of renewable energy for our operations. Two types of renewable energy are available to Pima County: one is Solar and the other is Biogas.

In 2010 and 2011, two, one-megawatt (1MW) each, solar power projects were completed. One is next to Tres Rios WRF (formerly Ina Road WRF) and the other is near the new Agua Nueva WRF. The electric energy generated at these two solar facilities is used to augment power for the wastewater treatment processes at the two regional facilities. In FY 13/14, these two facilities generated 4,034,785 kWh of energy, which could power almost 400 homes. **Table 1** lists the percentage of total purchased electrical energy is from solar power at Tres Rios WRF, Agua Nueva WRF, and entire RWRD in FY 13/14.

Table 1: Percentage of Purchased Power from Solar, FY 13/14			
RWRD Facilities	Tres Rios WRF	Agua Nueva WRF	All RWRD
Solar Power (%)	6.64%	16.13%	9.60%

RWRD is the second largest energy consumer within Pima County government. In November 2013, with the help from the Facility Management Department and the Finance and Risk Management Department, we published the first RWRD's "***Major Facilities Power Use and Costs Monthly Report***." This Report tracks the monthly energy consumption and costs of RWRD's major facilities including the (9) Water Reclamation Facilities, (28) Pump Stations, Odor Control Stations and Buildings. Close tracking of the energy consumption and costs indicated that the unit energy costs at the sub-regional facilities are relatively higher (**Table 2**) in comparison with what RWRD pays for solar power from the two existing solar facilities (**Table 3**).

Table 2: Average Annual Unit Cost, FY 13/14	
Facility	Annual Average Unit Cost
Avra Valley	$0.122/KWH
Green Valley	$0.109/KWH
Corona de Tucson	$0.135/KWH

Table 3: Unit Solar Power Cost	
Facility	Unit Solar Power Cost
Agua Nueva	$0.0959/KWH
Tres Rios	$0.0750/KWH

We acknowledge that the solar facilities were built when the utility incentives for solar energy were available and the respective incentives are no longer available. The current market, however, has indicated that the capital cost to build solar power facilities has decreased significantly in recent years.

Recently, RWRD invited public bids to install additional solar power facilities at three (3) outlying water reclamation facilities:

- Avra Valley WRF
- Corona de Tucson WRF and
- Green Valley WRF

These three water reclamation facilities currently utilize electricity provided by TRICO, (Avra Valley and Corona de Tucson) and TEP (Green Valley). The anticipated combined capacity of these three sites is approximately two (2) MW.

On December 9, 2014, the Pima County Board of Supervisors awarded the contract to Oakleaf Energy Partners Ohio, LLC. (Attachment A) The expected saving from these three solar facilities is in the range of $4.5M to $7.7M the next 20 years depending on the increase of commercial power rate (Attachment B).

Upon the completion of these solar facilities, solar power will account for about **15.6%** of the total power purchased by RWRD. RWRD expects to meet the County's solar power goal (15% by 2025) ahead of time.

The RWRD Sustainability and Energy Management Office (SEMO) are coordinating with other County departments in the pursuit of these 3 solar facilities. Should you have any question and/or suggestions, please feel free to contact Jing Luo at 520-724-6537 or myself at 520-724-6549.

cc:
Jing Luo – SEMO Manager, RWRD
Julie Robinson, Program Manager, County Sustainability and Conservation
John Sherlock, Deputy Director, Treatment, RWRD
Terry Finefrock, Chief Contracts & Procurement Manager, Procurement
Marc Lynn, Energy Manager, Facilities Management
Michael Kirk, Director, Facility Management

Attachments:
A: Board of Supervisors Agenda Item Summary
B: Expected Savings at the Three Sub-regional Facilities over 20 Years

Attachment A: Board of Supervisors Agenda Item Summary

BOARD OF SUPERVISORS AGENDA ITEM SUMMARY

Requested Board Meeting Date: 12-09-14

ITEM SUMMARY, JUSTIFICATION and/or SPECIAL CONSIDERATIONS:

Low Bid: Award of Contracts, Requisition No. 150000000000000003, Oakleaf Energy Partners Ohio, LLC (Headquarters: *Denver, Colorado*) three contracts in the cumulative 20 year amount of $5,250,940.00 for electricity to be provided from solar photovoltaic facilities designed, financed, installed, operated and maintained by the vendor for Green Valley, Avra Valley and Corona de Tucson wastewater reclamation facilities(WRF). Funding Source: Utility Expense Budget; Administering Department Regional Wastewater Reclamation District (RWRD)

RWRD WRF FACILITY	20 YEAR CONTRACT AMOUNT	TERM (YEAR)	20 YEAR EXPECTED CUMULATIVE SAVINGS	MASTER AGREEMENT
GREEN VALLEY	$2,233,851.00	20	$3,460,779.00	MA 15000000000000000
AVRA VALLEY	$1,980,580.00	20	$3,967,584.00	MA 15000000000000000
CORONA DE TUCSON	$1,036,509.00	20	$1,134,642.00	MA 15000000000000000
TOTAL	**$5,250,940.00**		**$8,563,005.00**	

BACKGROUND

Pursuant to Pima County Procurement Code 11.12.010 Competitive Sealed Bidding and as requested by the Regional Wastewater Department, Invitation for Bids 147692 was published in the legal newspaper of Pima County, posted to the Procurement Department Internet site and completed to establish service contracts to design, finance, install, operate and maintain solar facilities located on Pima County land via no cost lease to provide electricity for WRF operations. Notice of the solicitation was given directly to all vendors registered with Pima County for relevant commodities, researched and identified by the Procurement Contracts Officer, or provided by the Requesting Department(s) of which none were classified as SBE. Bids from six (6) firms were received.

Pursuant to the published solicitation terms the award of contracts are recommended to the responsive and responsible bidder that submitted the guaranteed production of kilowatt-hours (kWh) that generated the greatest cumulative savings versus projected utility costs (3% per year; historical increases in Arizona have averaged 4.1%) over the twenty (20) year term for each WRF facility.

The cumulative contract award amount of $5,250,940.00, and savings of $8,563,005.00, for the 20-year contract terms are based on the expected or engineered production of electricity (85,196,807 kWh) times the yearly contract price per kWh resulting in an average price of $0.0616 per kWh; about 50% of Pima County operations average $0.13 cost of kWh purchased from our current utilities.

The contracts include guaranteed minimum electricity production guarantees, 90% of the expected or engineered production quantity, for each contract year requiring that the contractor credit Pima County for at the difference in the utility and contract price per kWh for the quantity of kWh guaranteed and not delivered. The facilities have a 25-30 year expected generating life. At the end of the 20-year contract term Pima County may offer to purchase the facilities at not greater than appraised market value or require the contractor to remove at their sole expense.

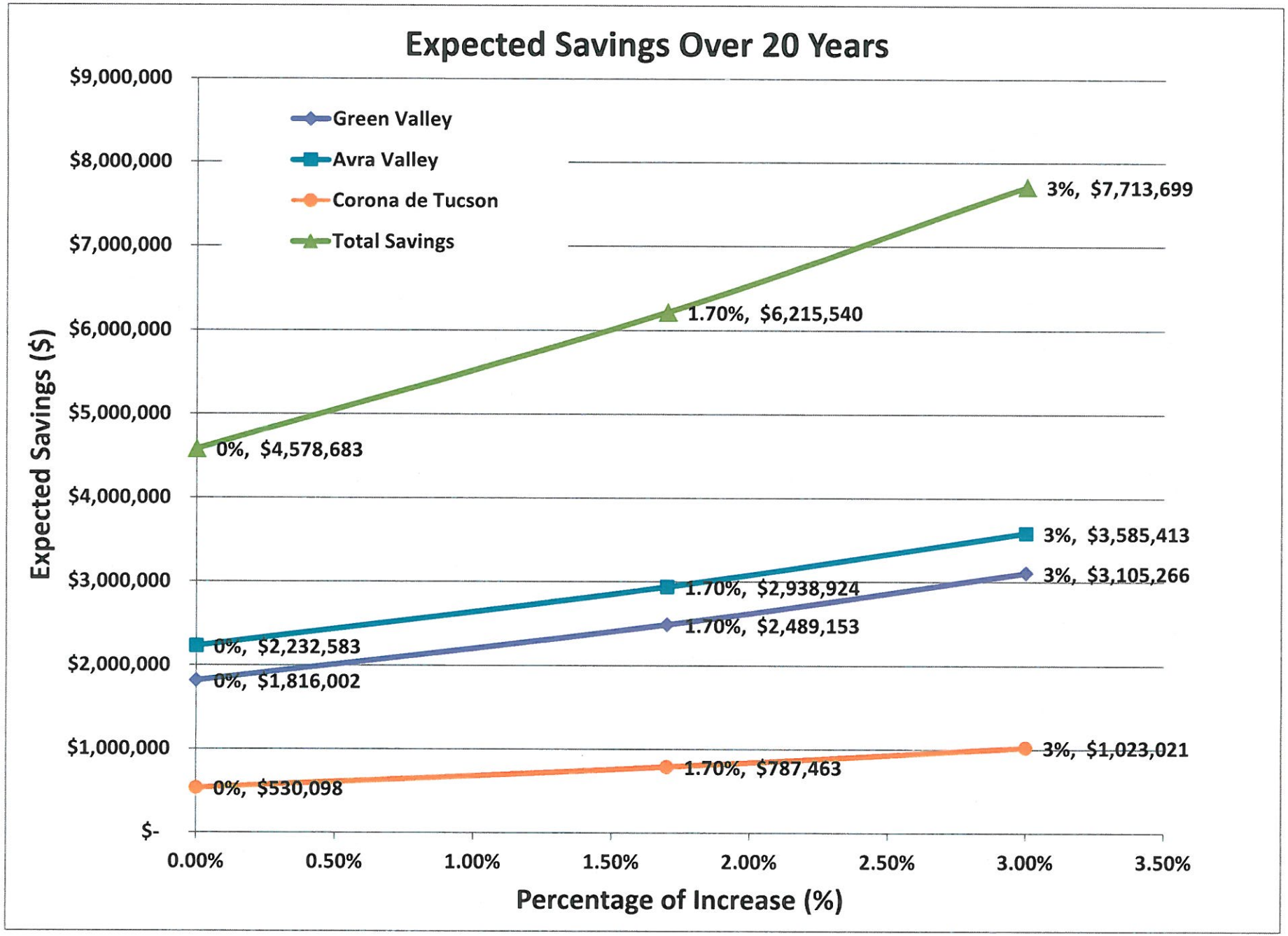
If this action is approved, Procurement will issue separate AMS Master Agreements for each of the WRF sites, referencing and consistent with this award and the executed contract documents.

Contract Officer: John Nanosky, 520-724-8165, Procurement Department

Payment System: AMS

CLERK OF BOARD USE ONLY: BOS MTG. _____ ITEM NO. _____

Attachment B: Expected Savings at the Three Sub-regional Facilities over 20 Years


Expected Savings Over 20 Years
$9,000,000
$8,000,000
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$-
Expected Savings ($)
Green Valley
Avra Valley
Corona de Tucson
Total Savings
3%, $7,713,699
1.70%, $6,215,540
0%, $4,578,683
3%, $3,585,413
3%, $3,105,266
1.70%, $2,938,924
1.70%, $2,489,153
0%, $2,232,583
0%, $1,816,002
3%, $1,023,021
1.70%, $787,463
0%, $530,098
0.00%
0.50%
1.00%
1.50%
2.00%
2.50%
3.00%
3.50%
Percentage of Increase (%)