mesa·az

OFFICE OF THE CITY CLERK

# SUSTAINABILITY & TRANSPORTATION COMMITTEE

September 25, 2014

The Sustainability and Transportation Committee of the City of Mesa met in the lower level meeting room of the Council Chambers, 57 East 1st Street, on September 25, 2014 at 8:40 a.m.

| COMMITTEE PRESENT | COMMITTEE ABSENT | STAFF PRESENT |
|---|---|---|
| Christopher Glover, Chairman | None | Christopher Brady |
| Dennis Kavanaugh | | Jim Smith |
| David Luna | | Dee Ann Mickelsen |

1. Items from citizens present.

There were no items from citizens present.

2-a. Hear presentations, discuss and provide a recommendation on the City of Mesa's Solar and Energy Efficiency Programs:

1. Mesa Solar Team

Chairman Glover stated that for the past few months, he has had the opportunity to work with the Mesa Solar Team, a group of citizens who are passionate about renewable energy in the City of Mesa. He stated that the team has presented him with signed petitions that were collected throughout the community.

Chuck Hughes, representing the Mesa Solar Team, introduced Marielyn White, Chairwoman of the group, who was prepared to respond to any questions the Committee may have. He also recognized members of the team, as well as individuals who signed petitions, who were present in the audience.

Mr. Hughes reported that the objective of the Mesa Solar Team is to encourage the City of Mesa and the City Council to implement aggressive solar policies for the betterment of the community. He explained that local renewable energy, such as solar, should be the cornerstone of Mesa's energy future. He also stated that "going solar" reinvests dollars in the community, creates jobs, lowers energy costs, protects the climate, saves Arizona's water and ensures a reliable and sustainable source of energy for the future.

Mr. Hughes displayed a PowerPoint presentation **(See Attachment 1)** and discussed various ways in which solar energy saves money and water and reduces pollution. (See Pages 2 and 3 of Attachment 1) He pointed out, for instance, that solar and other renewable energy sources ensure the country's future. He also spoke regarding the negative impact on the environment due to certain coal plant operations.

Mr. Hughes remarked that between 1918 and 2009, the oil and gas industry, which garners significant subsidies and tax advantages, has received an average of $4.86 billion per year. He said that such amounts equate to 2010 dollars. He noted, by way of contrast, that solar technology offers a "major upside" in terms of efficiencies and costs. He added that he provided the Committeemembers a magazine article titled "Stacking the deck," which discusses the concept of doubling the efficiency of solar cells. **(See Attachment 2)**

Mr. Hughes further referenced a document outlining a series of recommendations that have been proposed by the Mesa Solar Team. (See Page 5 of Attachment 1) He offered a short synopsis of the proposals as follows: That by 2025, at least 50% of City government's electricity and 20% of the community's electricity be generated by solar. He also highlighted the renewable energy goals of other cities and universities. (See Page 6 of Attachment 1)

Mr. Hughes, on behalf of the entire Mesa Solar Team, stated that it has been a pleasure working with members of the Council and City staff on such an important endeavor.

Chairman Glover thanked Mr. Hughes for the presentation.

2. City of Mesa Staff

Environmental and Sustainability Deputy Director Scott Bouchie introduced Energy Resources Director Frank McRae and Energy Resources Coordinator Tony Cadorin, who were prepared to address the Committee.

Mr. Bouchie displayed a PowerPoint presentation **(See Attachment 3)** and reported that over the last 18 months, the City has installed more than one megawatt of solar capacity, which will save an estimated $1.5 million over the next 20 years. He explained that staff makes the assumption that the price of conventional energy will increase (using an escalator rate of 3%). He stated that currently, staff is implementing only those solar programs that have a positive cash flow and generate a savings for the City from their inception.

Mr. Bouchie highlighted a series of photographs illustrating projects in which the City owns the solar installations. (See Pages 4 through 6 of Attachment 3) He also discussed additional projects wherein the City has entered into a Solar Services Agreement (SSA) with Solar City. (See Pages 7 through 11 of Attachment 3) He pointed out that Solar City installs, operates and maintains the solar systems and the City purchases the power from the vendor. He noted that the only cost the City incurs is the power generated from the solar installations. He said that the City has a fixed rate over a 20-year term and added that the cost will not increase during that period of time.

Mr. Bouchie referenced a chart created by staff at the Red Mountain Multi-Generational Center which compares utility costs at the facility with or without the installation of a solar system. (See

Page 13 of Attachment 3) He also spoke concerning various reasons that the City has invested in solar systems in the past. (See Page 14 of Attachment 3)

Mr. Bouchie provided a brief overview of a series of projects the City has completed in an effort to address energy efficiency. (See Page 15 of Attachment 3) He noted that the projects have resulted in $4.2 million in savings for the City. He commented, in addition, that staff conducted an energy audit of 1.5 million square feet of space in City facilities. He added that the audit is being used as "a roadmap" for the retro-commissioning of the Convention Center B and C Buildings and the Main Library in order to make them more energy efficient. (See Page 17 of Attachment 3)

Mr. Bouchie further provided a short synopsis of the 2013 energy consumption and reductions in City facilities. (See Page 18 of Attachment 3) He stated that staff, in partnership with Salt River Project (SRP), has hosted a series of workshops to educate the public with regard to solar systems and how to reduce energy consumption in their homes.

Mr. Bouchie also reported that staff has been working with Optony, a company that received a grant from the U.S. Department of Energy for the American Solar Transformation Initiative. He explained that the purpose of the initiative is to reduce the lead times for solar system installations. He said that currently, Mesa does not require a permit for solar installations, which would rank it "pretty high" in terms of Optony's research concerning the ease with which individuals can install solar systems in the community.

Mr. Bouchie, in addition, remarked that staff has partnered with Arizona State University (ASU) relative to the bulk purchasing of solar systems for City facilities. He explained that with the completion of the solar installation projects with Solar City, it might be possible for the City to bundle smaller projects with other communities in an effort to obtain better pricing on the installations.

Mr. Bouchie concluded his presentation by commenting that staff would like to meet with the Sustainability and Transportation Committee on an ongoing basis in order to update the members with respect to the City's solar and energy efficiency projects. He also commented that in conjunction with the budget process, staff would like to bring forward projects that "make sense" for the City. He added that staff will continue to work with the Mesa Solar Team in an effort to set goals for conservation and solar uses that are measurable and achievable from a financial perspective.

Mr. McRae addressed the Committee and offered a brief historical overview of the City's natural gas and electric utility systems, which were acquired in 1917. (See Page 23 of Attachment 3) He explained that the goal of the Energy Resources Department is to provide superior service, which is defined as safety, reliability and efficiency. He stated that such efforts are aligned with the Council's Strategic Initiatives. (See Page 24 of Attachment 3)

Mr. McRae displayed a diagram illustrating the generation, transmission and distribution of an electric utility network, all of which are interconnected to deliver power to a customer's home or business. (See Page 25 of Attachment 3) He also referenced a map demonstrating the City's Electric Service Area. (See Page 26 of Attachment 3)

Mr. McRae, in addition, discussed the Integrated Resource Planning (IRP) process, which is utilized by staff in order to acquire and plan for the City's energy supplies. (See Page 27 of Attachment 3) He noted that the concept was developed in the 1980s in an effort to assist utilities to take into account the long-term consequences of resource planning and acquisitions. He stated that in conjunction with the IRP, staff has developed an Action Plan as a means by which to acquire the resources and implement the programs selected through such a process. He also highlighted the IRP results. (See Page 28 of Attachment 3)

Mr. McRae further reported that in 2012, in conjunction with the IRP process, staff developed a pilot Solar Customer Program. He indicated that the purpose of the program was to incentivize customers to install solar systems. He briefly highlighted the Watt Up-Front Incentives in FY 2012/13, FY 2013/14 and FY 2014/15. (See Page 30 of Attachment 3) He commented that in exchange for offering the incentives, the City receives renewable energy credits from the kilowatt hours that are produced by the solar panels. He added that the City offers net metering, which means that for every kilowatt hour that is produced by a customer's solar panels, the person is compensated for the full retail rate he or she would normally pay for electricity.

Mr. McRae offered a short synopsis of additional programs developed by the Energy Resources Department. (See Page 31 of Attachment 3)

Chairman Glover thanked staff not only for making Mesa a more environmentally friendly community, but also working with the Mesa Solar Team.

2-b. Hear a presentation, discuss and provide a recommendation regarding a Wireless Antenna License with Verizon Wireless.

City Engineer Beth Huning introduced Right-of-Way Manager Lori Greco and Michael Zanes, a representative of Verizon Wireless, who were prepared to respond to any questions the Committee may have.

Ms. Huning displayed a PowerPoint presentation **(See Attachment 4)** and reported that Verizon Wireless has made a request to install, operate and maintain wireless service facilities on City-owned streetlights in Mesa's rights-of-way and public utility easements. She explained that as part of the wireless antenna license, Verizon Wireless is bringing the next generation in cell phone service to Mesa. She stated that the smaller, compact wireless service facilities, as opposed to traditional cell towers, would be used in those areas where there is an abundance of dropped calls and various capacity issues in the system.

Ms. Huning commented that the license would have a five-year initial term, with an automatic five-year renewal and two optional five-year renewals. She noted that Verizon Wireless would be assessed Mesa's transaction privilege tax and permitting fees, as well as an annual rental rate for the use of the City's streetlights and rights-of-way.

Ms. Huning referenced a drawing illustrating the various components of the wireless service facilities. (See Page 3 of Attachment 4) She said that included in the design is the installation of an equipment cabinet on a concrete slab. She indicated that per the City's request, Verizon Wireless has agreed, depending on the specific site, to design decorative walls and landscaping around the wireless service facilities in an effort to obscure them from the public's view.

Committeemember Kavanaugh commented that he would assume that many Valley artists would be happy to work with Verizon Wireless to transform the cabinets into works of public art that conform to specific locations in the community. He stated that he would encourage staff to pursue such partnerships in this regard.

Ms. Huning further reported that Verizon Wireless would propose to install eight wireless service facilities in the community. She displayed a map illustrating the location of the first five sites, which are based on capacity needs in the system, including high call volumes and data usage. (See Page 5 of Attachment 4)

Ms. Huning also remarked that Scottsdale, Tempe and Phoenix have adopted rates for the wireless service facilities, which are generally viewed from a volume or land lease structure. (See Page 6 of Attachment 4) She stated that the City has proposed a similar rate structure. She noted that if this Committee concurs with the proposed rate structure, staff would then present the proposal to the Audit, Finance and Enterprise Committee for discussion and consideration. She added that the agreement includes a three percent annual increase with respect to the rate structure.

Committeemember Kavanaugh voiced support for the proposal and said that with the new cabinet configuration, he looked forward to "fewer fake palm trees." He suggested that the proposed design could be visually aesthetic, provide function for the customers and generate revenue for the City through the use of its property.

Chairman Glover thanked Verizon Wireless for partnering with the City to design the wireless service facilities in an aesthetic manner.

It was moved by Committeemember Kavanaugh, seconded by Committeemember Luna, that this item be forwarded on to the Audit, Finance and Enterprise Committee for discussion and consideration.

Carried unanimously.

Chairman Glover thanked everyone for the presentation.

2-c. Hear a presentation, discuss and make a recommendation regarding modifying the City's Terms and Conditions for the Sale of Utilities to provide modifications and alternatives to the requirements to receive services outside of the City of Mesa and amending the modification section of the Terms and Conditions.

Development and Sustainability Director Christine Zielonka introduced Water Resources Director Dan Cleavenger and Deputy Director of Development and Sustainability Beth Hughes-Ornelas, who were prepared to address the Committee. She also recognized other staff members who were present in the audience.

Ms. Zielonka displayed a PowerPoint presentation **(See Attachment 5)** and reported that staff was prepared to present the proposed changes to the City's Terms and Conditions for the Sale of Utilities for single residential lots located outside of the City limits. She explained that specifically, that would consist of properties in County islands that are seeking City water service.

Ms. Zielonka stated that the proposal was developed by the Development and Sustainability Department based on problems that have arisen when staff has worked with County residents. She also noted that the Water Resources Department and the City Attorney's Office have played important roles throughout this process.

Ms. Zielonka indicated that the proposed revisions included modification, with conditions, of required development standards as follows:

- One parcel for detached single residence
- Multi-residence and commercial must comply with development standards prior to receiving service
- Deferral of road, fire and water improvements until annexation
- Requires Utility Service Agreement recorded against the property

In response to a question from Committeemember Luna, Ms. Zielonka clarified that to the best of her understanding, there is no limit on the size of a parcel for a detached single residence, as long as it has not been subdivided into two parcels.

Committeemember Kavanaugh stated that the suggested revisions are "a good proposal." He noted, however, that one of the proposed modifications is that improvements would be deferred until annexation. He inquired how the City would guarantee that a property owner who purchases property that has been granted a deferral would know what his or her obligations will be with respect to complying with the development standards prior to receiving water service.

Ms. Zielonka responded that staff has engaged in multiple discussions with regard to this issue. She clarified that the improvements would only be deferred prior to annexation. She pointed out that the Utility Service Agreement is recorded with the property and said that it would be necessary for future owners to perform their due diligence to determine if there were any recorded restrictions on the property. She added that the Utility Service Agreement will include specific requirements relative to the offsite improvements that must be completed prior to annexation.

Committeemember Kavanaugh stated that as a condition for the initial property owner who is receiving the benefit of the proposed revisions, he inquired whether the individual could sign an agreement or affidavit wherein the person would swear to convey or provide such information to any proposed purchaser of the property. He commented that with such a document, the City could demonstrate to a future property owner that the former owner was, in fact, obligated to fulfill such responsibilities and not the City. He added that such a document is needed as part of this process in addition to the Utility Service Agreement that is recorded with the property.

Deputy City Attorney Jim Smith concurred with Committeemember Kavanaugh's comments and explained that staff was also concerned with respect to a future homeowner who purchases the property. He stated that it might be appropriate for staff to create two documents that could be recorded in this regard.

Ms. Zielonka remarked that staff would work with the City Attorney's Office to draft such a document prior to the item being brought forward to the full Council for discussion and approval.

Ms. Zielonka, in addition, reported that the Terms and Conditions for the Sale of Utilities would also include a Utility Service Agreement fee, which is equivalent to all of the development impact fees. She explained that for a single residence lot, the amount would equate to approximately $7,000, including connection to the City's water and wastewater systems.

Ms. Zielonka offered a brief historical overview of the Utility Service Agreement (See Page 4 of Attachment 5) and Council and Committee reviews of the program. (See Page 5 of Attachment 5)

Ms. Zielonka also reviewed the various elements of developing to City standards. (See Page 6 of Attachment 5) She noted that historically, the City has required an in-lieu payment at the time that City services are provided to a property owner. She stated that City Manager Christopher Brady has proposed that the property owner pay the cost of the street improvements immediately prior to annexation and not at today's cost. She indicated that what a person paid 10 or 15 years ago as an in-lieu payment will not pay for today's cost.

Ms. Zielonka further commented that the property owner of a single residence parcel must also meet Fire Code requirements for access to the parcel. She explained that typically, this would mean a property owner placing a fire hydrant immediately adjacent to the property. She stated that this is one of the items that could possibly be deferred. She added that the property owner would then have the option to install sprinklers in the residence for life-safety protection.

In response to a question from Committeemember Luna, Ms. Zielonka clarified that the access road would be considered as the road in front of the residence as opposed to a private driveway.

City Manager Christopher Brady remarked that the Fire Code requires homes to be located within 150 feet from the City's access point or frontage. He explained that if a home were constructed deeper into a lot beyond the 150-foot requirement, a proposed option would be for the property owner to install a sprinkler system in the residence. He stated that when a person builds outside Mesa's corporate limits, but wants to purchase City water, the installation of a fire hydrant could be deferred until annexation. He pointed out that when annexation occurs, however, the property owner would still be required to install the fire hydrant even if the person installed the fire sprinklers.

Ms. Zielonka clarified that it would be necessary for the installation of the fire hydrant to be completed prior to the final annexation action by the Council.

Ms. Zielonka also commented that staff was not recommending that the construction of all domestic water lines necessary for pressure and flow be deferred.

Mr. Cleavenger stressed the importance of the City maintaining the standard details and requiring that water system improvements are done correctly for future extensions.

Ms. Zielonka noted that staff provided the Committeemembers a draft of the proposed changes to the Terms and Conditions. She briefly highlighted such changes (See Page 7 of Attachment 5) and staff's recommendations. (See Page 8 of Attachment 5)

Ms. Zielonka stated that staff was seeking direction from the Committee regarding this item. She commented that if such recommendations are approved, the ordinance will be included on the October 6, 2014 Regular Council meeting agenda for introduction, followed by Council adoption at the October 20, 2014 Regular Council meeting.

Chairman Glover stated that it was the consensus of the Committee that this item move forward to the full Council. He thanked staff for their efforts and hard work in this regard.

2-d. Hear a presentation and discuss proposed INNOV8 program to repurpose abandoned pipelines and existing conduit assets for rental by non-City utilities.

City Engineer Beth Huning and Right-of-Way Manager Lori Greco addressed the Committee relative to this agenda item.

Ms. Huning displayed a PowerPoint presentation **(See Attachment 6)** and reported that earlier this year, City Manager Christopher Brady, in conjunction with Team INNOV8, challenged City departments to devise programs that would benefit the community, utilize City assets and save money for Mesa taxpayers.

Ms. Huning explained that the Engineering Department and the Information Technology Department (ITD) joined forces and developed a program to repurpose abandoned City pipelines and existing conduit assets to be used on a rental basis by various telecommunication companies.

Ms. Huning stated that as part of the program, staff identified more than 50 miles of abandoned water and sewer pipe in the City's right-of-way. (See Page 2 of Attachment 6) She noted that staff was also researching other pipelines, such as natural gas, that may be available in the right-of-way and could be reused in a safe manner.

Ms. Huning indicated that approximately ten years ago, the City installed a bank of 12 2-inch conduits throughout the community. She commented that currently, 38 miles of empty conduit is in place. (See Page 3 of Attachment 6) She explained that in previous years, it was the opinion of staff that such conduit would meet the City's needs. She noted, however, that with advances in technology, it has been determined that only four conduits are needed at this time.

Ms. Huning commented that staff would propose to lease the unneeded conduit lines to various telecommunications companies that are interested in providing service in Mesa. She highlighted a document outlining the benefits of such a proposal. (See Page 4 of Attachment 6) She noted that a major benefit to the City would be that the companies would not cut the City's pavement or restrict traffic. She also stated that as businesses and industries come into the community, not only do they require water, sewer and power, but also access to fiber and data. She added that for Mesa to be "a tech city," it was crucial to have these assets in the City's right-of-way.

Committeemember Kavanaugh cited, by way of example, that a key element in the Centrica project locating to the Fiesta District was the fact that the City already had the fiber infrastructure in place.

Ms. Huning displayed a chart titled "Implementation Schedule." (See Page 5 of Attachment 6) She explained that there were different ways in which the City could benefit from this process, including a per-foot cost or in-kind services (i.e., installation of conduit, fiber or microduct fiber).

Chairman Glover thanked staff for their innovation in utilizing City assets that could benefit the community.

3. Adjournment.

Without objection, the Sustainability and Transportation Committee meeting adjourned at 9:51 a.m.

I hereby certify that the foregoing minutes are a true and correct copy of the minutes of the Sustainability and Transportation Committee meeting of the City of Mesa, Arizona, held on the 25th day of September, 2014. I further certify that the meeting was duly called and held and that a quorum was present.

_____
DEE ANN MICKELSEN, CITY CLERK

abg/pag
(attachments – 6)

# CASE FOR RENEWABLE ENERGY IS COMPELLING

- SAVING $$ NOW AND IN THE FUTURE
- SAVES WATER AND REDUCES POLLUTION
- ENSURES STABLE ENERGY SOURCE-SUSTAINABLE
- TECHNOLOGY READY AND IMPROVING

Objective is to encourage the City of Mesa and the City Council to implement solar focused policies for the betterment of our community. This is important now and for future generations. Solar energy is the most abundant energy resource available: 173,000 terawatts strikes the earth continuously. More than 10,000 times the world's total energy use.

## SAVES $$

- Major savings from existing City of Mesa solar installations
- Even W/O incentives, Red Mtn. Police Dept.: saves $90K over 20 years
- With Incentives $206K.

## SAVES WATER/ REDUCES POLLUTION

WATER- Does not count billion of gal. to extract oil/gas and "clean" coal

COAL PLANT (CLOSED CYCLE) - 500 GAL. /MWh
(OTHER REF. 1000 GAL)

Navajo Plant - 8,476,000,000 gal. /yr.

POLLUTION – Health, Tourism (e.g. Grand Canyon), Climate

CO2

COAL (With scrubbers): 2201-2219 LB/MWh

Navajo Plant – 37,321,640,000 LBS. /YR.

OIL: 1672 LB/MWh

GAS: 1135 LB/MWh

# RENEWABLE ENERGY- CONCLUDED

SUSTAINABLE

- Solar/other renewables ensure our future.
- Hydro-carbons (Oil, Gas, and Coal) have water and pollution problems

  AND

  Shale/Fracking not as rosy as pictured

"Shale wells start strong and fade fast"
"Red Queen Effect"
BUSINESS WEEK, 10 OCT. 2013

# TECHNOLOGY PROVEN

- Here and throughout the world, even without the huge tax incentives enjoyed by the oil and gas industry:
  $4.86 B AVG/YR 1918-2009 in 2010 dollars

- Solar has large upside with efficiencies and cost- see one example in the attachment:
  Efficiency of cells from .2 to .35 with goal of .5
  (Minimum of 75% improvement; cost equal to coal)

# RECOMMENDATIONS

As a forward-looking city in the Valley of the Sun, we urge you to continue to invest in our future through solar as you have done. Build upon a solid foundation of previous work to make Mesa a solar leader by pursuing the following goals:

- Finding innovative ways to make solar more available to residents by addressing the upfront cost as many municipalities have done
- Increasing the use of solar powering our city government operations
- Setting goals for attaining a percentage of energy use in the city as a whole and for government operations.

# Challenging Ambitious Goals Move People, Create Energy and Excitement to Achieve Major Changes that Make a Difference

At least 50% of city government electricity by solar (renewable) energy and 20% of the city as a whole by 2025.

**Benefits (http://my.solarroadmap.com/national)**

- $112.8 M from economic activity
- 5850 Job years created
- Pollution cut by equivalent of 120,000 cars

Plus benefits from previous pages

**Other Cities'/University Goals**

- Denver: 50% Ren. by 2020
- Lancaster: 100% Ren by 2020
- ASU: Carbon Neutral by 2025

Thank you and the city staff for the support and we look forward to working with and assisting you in this important endeavor.

# REFERENCES

Introduction
Energy.gov Official Website

Red Mtn. Police Dept. - City staff

Water Use/Pollution
Dept. of Energy Official Website
Peabody Energy Official Company Website
Wikipedia- Navajo Generating Station, 69 References

Sustainable Energy
Shale Oil/Gas – Red Queen Effect Business Week 10 Oct. 2013
Through The Looking Glass- Lewis Carroll

Technology Ready
Oil/Gas Subsidies/Incentives
Report: "What Would Jefferson Do? The Historical Role of Federal Subsidies in Shaping America's Energy Future", Dec., 2011, DBL Investors Venture Capital Firm

Article from Science and Technology Section of the Economist, 22 Feb. 2014 ATTACHED

Recommendations
Solar Road Map, Official Website
Denver Sustainability Official Website
Lancaster Power Authority; Lancaster Official Website
ASU Official Website

A set of observations that mostly match what a sensible-sounding theory predicts may seem a strong case. But not everyone is convinced. One problem is that the changes in atmospheric thickness and wind speed Dr Francis observed have become apparent only since the mid-1990s, which gives fewer than 20 years of data to work with. Another difficulty concerns the blocking patterns. Dr Francis's theory suggests there will be more of them in future, as the world warms. But climate models unanimously disagree, saying that global warming will produce fewer of them. Someone has to be wrong.

Trying to apply the theory to this year's batch of wild weather causes even more headaches. America's cold snap was indeed produced partly by a wayward jet stream. But Dr Francis herself points out that Britain's gales and rain are a different story, and that this year's North Atlantic jet stream has in fact been stronger than normal. That illustrates one of the chief frustrations of climate science. The weather is naturally changeable, which means many years of data are needed to extract a clear trend from among all the noise. Were the American freeze and the British floods caused by a weaker jet stream? No one can say for sure. But if Dr Francis and her colleagues are right, the odds on a repeat performance will get shorter every year. ■

Solar energy

# Stacking the deck

CHICAGO

**A way to double the efficiency of solar cells is about to go mainstream**

SUNLIGHT is free, but that is no reason to waste it. Yet even the best silicon solar cells—by far the most common sort—convert only a quarter of the light that falls on them. Silicon has the merit of being cheap: manufacturing improvements have brought its price to a point where it is snapping at the heels of fossil fuels. But many scientists would like to replace it with something fundamentally better.

John Rogers, of the University of Illinois, Urbana-Champaign, is one. The cells he has devised (and which are being made, packaged into panels and deployed in pilot projects by Semprius, a firm based in North Carolina) are indeed better. By themselves, he told the AAAS, they convert 42.5% of sunlight. Even when surrounded by the paraphernalia of a panel they manage 35%. Suitably tweaked, Dr Rogers reckons, their efficiency could rise to 50%. Their secret is that they are actually not one cell, but four, stacked one on top of another.

Solar cells are made of semiconductors,

**Power and beauty**

and every type of semiconductor has a property called a band gap that is different from that of other semiconductors. The band gap defines the longest wavelength of light a semiconductor can absorb (it is transparent to longer wavelengths). It also fixes the maximum amount of energy that can be captured from photons of shorter wavelength. The result is that long-wavelength photons are lost and short-wave ones incompletely utilised.

Dr Rogers gets round this by using a different material for each layer of the stack. He chooses his materials so that the bottom of the band gap of the top layer matches the top of the band gap of the one underneath, and so on down the stack. Each layer thus chops off part of the spectrum, converts it efficiently into electrical energy and passes the rest on.

The problem is that the materials needed to make these semiconductors (including arsenic, gallium and indium) are costly. But Dr Rogers has devised a way to overcome this. Normal solar-cell modules are completely covered by semiconductor, but in his only 0.1% of the surface is so covered. The semiconducting stacks, each half a millimetre square, are scattered over that surface as a matrix of dots, meaning that a panel with an area of 125 square metres has half a million of them. Each stack then has a pair of cheap glass lenses mounted over it. These focus the sun's light onto the stack, meaning that all incident light meets a semiconductor.

The semiconductor stacks themselves are printed onto a cell one layer at a time by a rubber stamp, which picks them up from a crystal wafer of the appropriate material. This wafer has been grown as a series of layers, separated by a substance which can easily be dissolved away. By scoring a chequerboard of cuts through the layers to create squares of the correct size, and then dissolving the filler, layer after layer of semiconductor squares are created, which the rubber stamp peels away and places on the cell. Repeat the process with the other three semiconductors, and package the whole thing with electrical connectors and a transparent protective coat, and—presto!—you have a highly efficient solar panel.

Semprius's panels are now being tested at 14 sites around the world. How much they will cost to make when manufacturing is running at full tilt is not yet clear, but Dr Rogers said that Siemens, a big German firm which is one of Semprius's investors, reckons that they have the potential to produce cheaper electricity than coal-fired generators can. Solar energy obviously cannot replace fossil fuels completely until the problem of banking some of what is collected during the day, for use at night, is solved. But at this sort of cost it can make a useful (and unsubsidised) contribution.

The new panels have aesthetic advantages, too. The 99.9% of them not covered by stacks can be used for art. Seen from the sun's point of view (ie, straight ahead), they appear black because the lenses are focused on the stacks, which absorb all the light falling on them. Viewed obliquely, however, their foci are on other parts of the panel. The result, as the picture shows, can be quite pleasing—and certainly prettier than a coal-fired power station. ■

Olfactory communication

# Spot the difference

CHICAGO

**Hyenas talk to each other, as it were, through their backsides**

TO TELL a hyena it stank would not be an insult. It has been known for decades that these animals communicate using a pungent material called hyena butter. This forms in pouches next to their anuses and they smear it onto plants for other hyenas to sniff and draw conclusions about the depositor.

It has also been long suspected that the smell—mainly the result of small fatty-acid, ester and alcohol molecules—is generated not directly by hyenas themselves, but rather by bacteria that live in the pouches. The details, however, are obscure. They are less obscure now, though, thanks to the work of Kevin Theis of Michigan State University, who has spent much of his career analysing the contents of hyena pouches. And, at a session at the AAAS meeting, he shared his conclusions with an eager audience.

There are four species of hyena, three of which are solitary and one gregarious. Dr Theis compared one of the solitary species, ▸▸

# Environment & Sustainability
# Energy Related Successes and Next Steps

Scott Bouchie
Deputy Director
Environmental & Sustainability

# Discussion

- Solar
- Energy Efficiency
- Public Outreach
- Next Steps - Moving Forward

# Solar Benefits & Issues

- Over a 1MW solar portfolio
- Savings of nearly $1.5M over 20 years
- Reduces carbon footprint
- Community visibility
- Meets the City's strategic initiatives
- Currently only done in positive cash flow areas
- SRP incentives changed in May 2014

# 70 KW - Concentrated Photovoltaic (CPV) Dual Tracking System

**Water Treatment Plant at Brown Road**

- Solar generation offsets electrical usage at the Red Mountain ballparks

# 15 KW - Photovoltaic (PV) System

**Fire Station 220**

- Roof mounted
- Solar power offsets electrical usage

# 5 KW - Photovoltaic System

**Fire Station 219**

- Roof mounted
- Solar power offsets electrical usage

mesa·az

# 185 KW - Photovoltaic System

**Fire/Police Station 212**

- Carport mounted providing
- Solar power which offsets electrical usage
- Shaded parking for the police vehicles

mesa·az

# 352 KW - Photovoltaic System

**Red Mountain Library**

- Carport mounted
- Solar power offsets electrical usage
- Shaded parking

# 272 KW - Photovoltaic System

**Fiesta Police Sub Station**

- Carport mounted system
- Solar power offsets electrical usage
- Shaded parking

# 294 KW - Photovoltaic System

**Red Mountain Multi-Generational Center**

- Carport mounted
- Solar power offsets electrical usage
- Shaded parking

# 169 KW - Photovoltaic System

- **<u>Red Mountain Police Substation</u>**
- Carport mounted, the
- Solar power offsets electrical usage
- Shaded parking

# Solar Services Agreement (SSA)

- Discrete SSA for each location
  - System size, price per kilowatt hour (kWh), production guarantees
- Solar vendor
  - Installs, operates, maintains solar system and sells power
- Mesa purchases energy at agreed upon rate
- Term 20 years

SolarCity

ity of Mesa
d Mountain Multi Gen Center
50 E Adobe St, Mesa, AZ 85207
stem Size: 305.3 kW DC

## SOLAR PPA SAVINGS OVER TIME

Budgetary Proposal, pricing to be confirmed with engineering audit.

Price valid until 02/15/13

| Year | Utility Costs without Solar | kWh Purchased* | PPA Cost per kWh | PPA Payments with Solar* | Sales Tax on PPA Payments | Utility Bill with Solar PPA | Total Electricity Costs | Net Savings* |
|---|---|---|---|---|---|---|---|---|
| 1 | $116,603 | 491,681 | 0.061 | $29,993 | $2,399 | $79,472 | $111,864 | $4,739 |
| 2 | $120,101 | 489,223 | $0.061 | $29,843 | $2,387 | $82,175 | $114,405 | $5,696 |
| 3 | $123,704 | 486,764 | $0.061 | $29,693 | $2,375 | $84,968 | $117,036 | $6,668 |
| 4 | $127,415 | 484,306 | $0.061 | $29,543 | $2,363 | $87,855 | $119,761 | $7,654 |
| 5 | $131,238 | 481,848 | $0.061 | $29,393 | $2,351 | $90,839 | $122,583 | $8,654 |
| 6 | $135,175 | 479,389 | $0.061 | $29,243 | $2,339 | $93,923 | $125,505 | $9,670 |
| 7 | $139,230 | 476,931 | $0.061 | $29,093 | $2,327 | $97,110 | $128,530 | $10,700 |
| 8 | $143,407 | 474,472 | $0.061 | $28,943 | $2,315 | $100,404 | $131,662 | $11,745 |
| 9 | $147,709 | 472,014 | $0.061 | $28,793 | $2,303 | $103,808 | $134,904 | $12,805 |
| 10 | $152,140 | 469,556 | $0.061 | $28,643 | $2,291 | $107,326 | $138,260 | $13,880 |
| 11 | $156,705 | 467,097 | $0.061 | $28,493 | $2,279 | $110,961 | $141,734 | $14,971 |
| 12 | $161,406 | 464,639 | $0.061 | $28,343 | $2,267 | $114,718 | $145,329 | $16,077 |
| 13 | $166,248 | 462,180 | $0.061 | $28,193 | $2,255 | $118,601 | $149,050 | $17,198 |
| 14 | $171,235 | 459,722 | $0.061 | $28,043 | $2,243 | $122,613 | $152,900 | $18,335 |
| 15 | $176,372 | 457,264 | $0.061 | $27,893 | $2,231 | $126,760 | $156,884 | $19,488 |
| 16 | $181,664 | 454,805 | $0.061 | $27,743 | $2,219 | $131,045 | $161,007 | $20,657 |
| 17 | $187,114 | 452,347 | $0.061 | $27,593 | $2,207 | $135,472 | $165,273 | $21,841 |
| 18 | $192,727 | 449,888 | $0.061 | $27,443 | $2,195 | $140,048 | $169,687 | $23,040 |
| 19 | $198,509 | 447,430 | $0.061 | $27,293 | $2,183 | $144,776 | $174,253 | $24,256 |
| 20 | $204,464 | 444,972 | $0.061 | $27,143 | $2,171 | $149,662 | $178,977 | $25,488 |
| 21 | -- | – | -- | – | – | – | -- | – |
| 22 | -- | – | -- | – | – | – | -- | – |
| 23 | -- | – | -- | – | – | – | -- | – |
| 24 | -- | – | -- | – | – | – | -- | – |
| 25 | -- | – | -- | – | – | – | -- | – |
| **Total** | | | | | | | | $293,562 |

* Values are estimated
Note: Sales tax on PPA payments is displayed separately. PPA rate is shown without assumed sales tax.

v7.2.0 XML

© 2012 SolarCity

# Reasons for Solar

- Stimulus funds
- LEED certification
- Save money
  - SSA
  - Most of our solar energy produced for this reason
- Reduces greenhouse gas emissions

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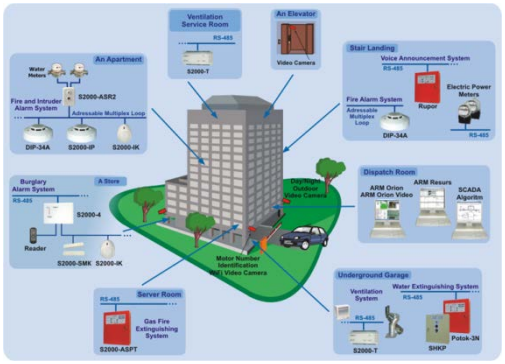
# COM - EECBG Allocation - $4.2M

1. Facilities Cool Roofing & Lighting Retrofits - $1.65M
2. LED Streetlamps for Transportation - $1M
3. Solar CPV Installation at RM Ball Fields - $350K
4. Central Main St. Development Plan - $315K
5. International Energy Conservation Code - $13K
6. SE Wastewater Plant Aeration - $755K
7. Siemens Energy Audit - $103K
8. Building Controls Guidelines - $30K

# COM - Energy Audit

- Evaluated 1.5 M sq. ft. Facilities
- 50+ Buildings and Parks
- Wastewater Treatment Plants
- Streetlamps & Parking Lots
- Solar

# Building Retro-Commissioning




## Budgeted Current Projects

### Convention Center B & C:

- Replace air handler units on B building
- Rebuild air hander units in C building
- Add building controls to B & C
- Add plate and frame to separate district cooling from buildings, reduce usage

### Main Library:

- Lighting retrofit all 3 floors
- Rebuild air handler units
- Add and upgrade building controls
- Replace outside lighting with LEDs
- Add plate and frame to separate district cooling from buildings, reduce usage

# City Facilities
# 2013 energy consumption and reductions

- **Energy consumed in kWh 142,010,973**

COM - 27%
SRP - 73%

**Solar equipment generation**

- Beginning of 2013 ≈ .12%
- End of 2013 ≈ .74%
- Current status ≈ 1.2%

**Energy Efficiencies**

- Reduced energy consumption ≈ 3%
- Target payback within life cycle
- Reduction of greenhouse gas emissions

# Living Green

- City of Mesa hosting workshops that teach our residents how to be sustainable at home
- Regional Leadership, Quality of Life, Community Engagement
- Partnered with SRP on workshops for the home, solar and other activities
- Customer Contacts, Awards Won

# American Solar Transformation Initiative

OPTONY

Powered by SunShot
U.S. Department of Energy

# Next Steps & Moving Forward

**Updated energy codes, guidelines and standards**

- Meet with SAT Committee on an ongoing basis to review and plan

**Strategies and planning for future**

- As part of the budget process bring projects forward
- Future funding needs
- Solar without incentives
- Work with Mesa Solar Group to Set Goals for Conservation and Solar

# Energy Resources Department
# Renewable Energy Programs



**Providing safe, reliable and efficient natural gas and electric utility services since 1917**

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# BACKGROUND

- Mesa purchased the gas and electric utility systems from Dr. AJ Chandler in 1917.
- 12th largest publicly owned gas utility.
- Top 15% of publicly owned electric utilities & Electric Customers.
  - 13,300 Residential Customers
  - 2,300 Commercial Customers
  - City of Mesa is our largest customer
    - Mesa City Plaza
    - District Cooling System
- Stable source of revenue funding city services.
- Strive for <u>superior</u> service to our customers.

# IGNMENT OF COUNCIL'S STRATEGIC INITIATIVES & PARTMENT'S GOALS

| | Economic Development | Quality of Life | Community Engagement | Financial Stability | Regional Leadership |
|---|---|---|---|---|---|
| Safety | | x | x | x | x |
| Reliability | x | x | | x | x |
| Efficiency | x | x | x | x | x |

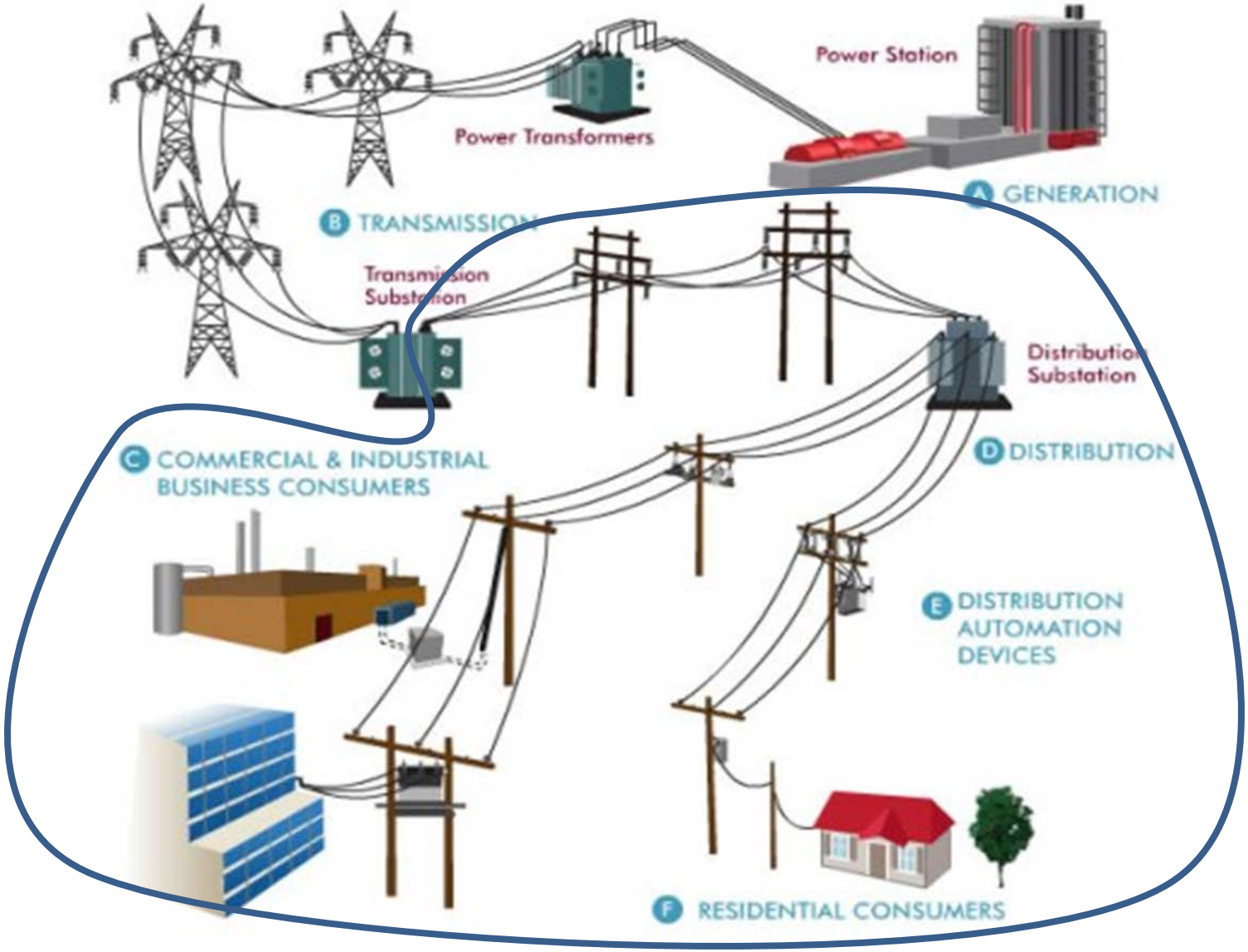
**American Public Power Association**

- 2012 Gold Reliable Public Power Provider (RP3)
- 2012 Electric Utility Safety Award
- 2014 Platinum Reliable Public Power Provider (RP3)

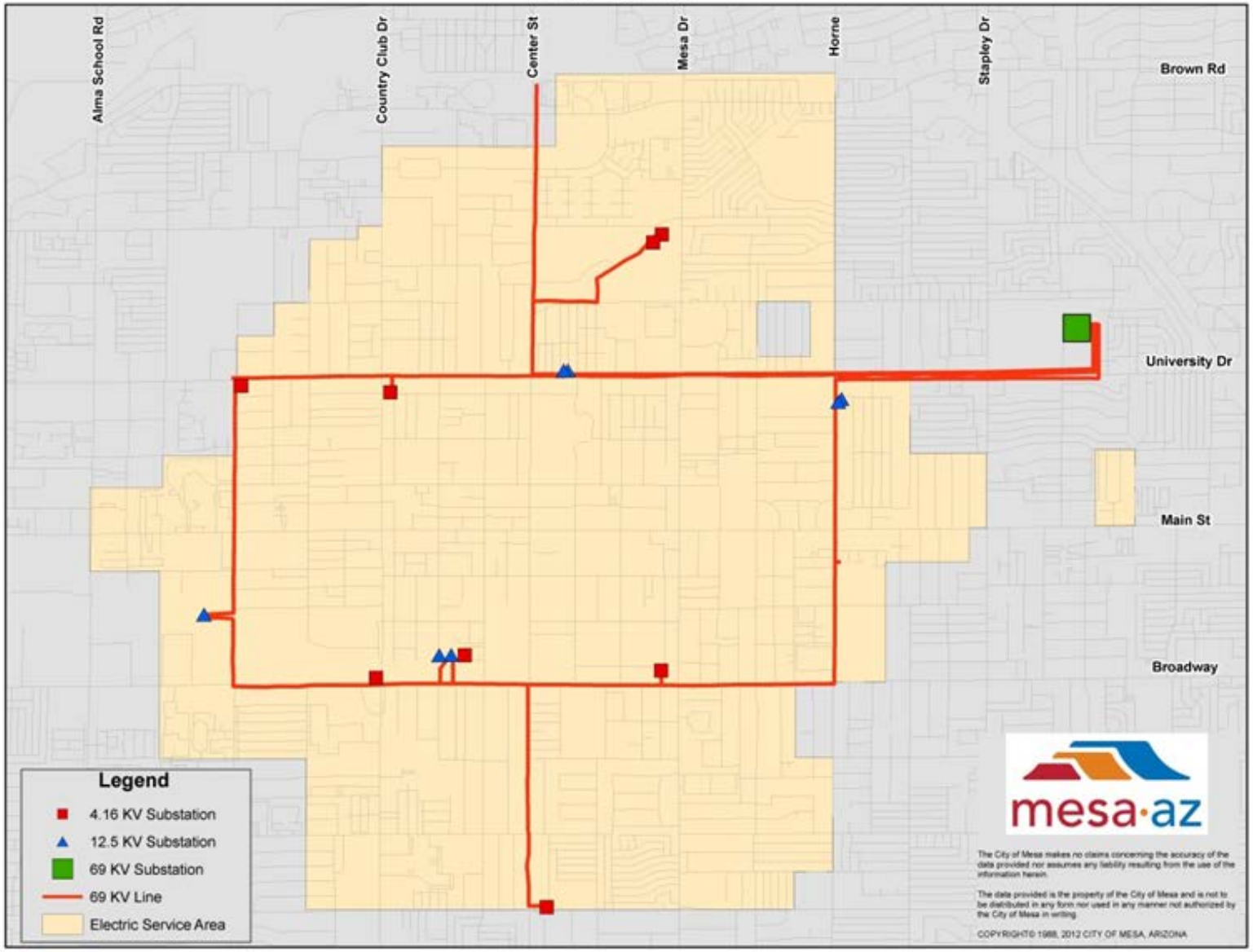
**Public Technology Institute**

- 2012/2013 – Solutions Award - Solar Dusk to Dawn Lighting

# ECTRIC UTILITY NETWORK
# NERATION / TRANSMISSION / DISTRIBUTION



# CITY OF MESA ELECTRIC SERVICE AREA
## 69 KV CIRCUIT



# RP = INTEGRATED ELECTRIC ESOURCE PLANNING

- Electric Industry Best Practice.
- Planning & acquisition of energy supplies – a balance of meeting our customers' energy requirements
  - Reliably;
  - At least cost; and
  - Be stewards of the environment.
- A "Level Playing Field" to identify & evaluate technically and economically viable resource options.
- An Action Plan is developed and implemented to acquire the resources and implement the programs selected through the process.

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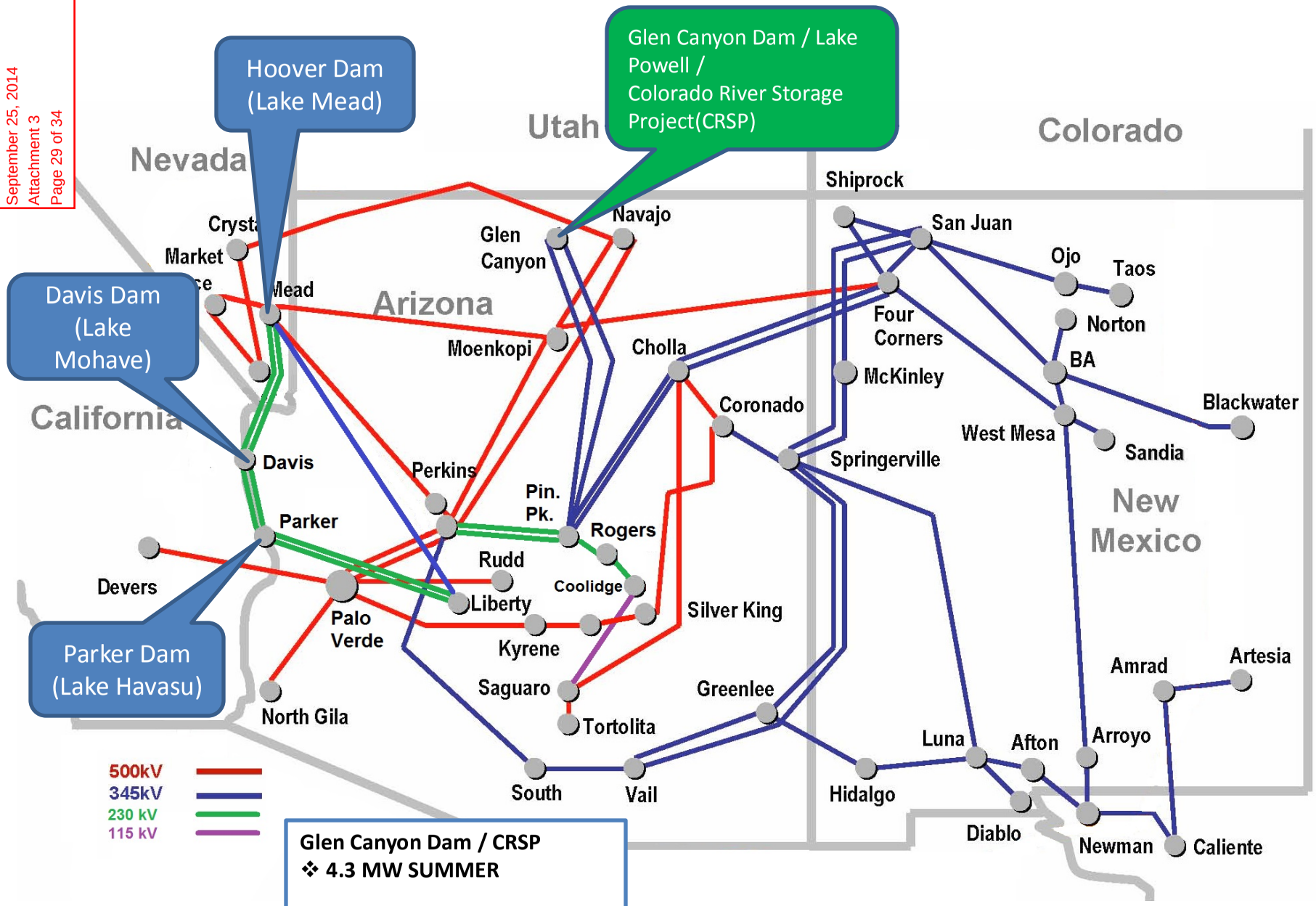
City of Mesa
Energy Resources Department
P.O. Box 1466
Mesa, AZ 85211-1466
Phone: 480.644.4444
Fax: 480.644.3336
E-mail: EnergyResources.info@mesaaz.gov

**2012 Integrated Resource Plan**

City of Mesa Energy Resources Department
Maricopa County
State of Arizona

# RP RESULTS

- Reliability
- Economic and Efficient
- Resource Portfolio:
  - 20% - Renewable Hydro & Customer Owned Solar
  - 76% - Fixed & Advantageous prices
    - Competitive Solicitations
    - Portfolio of long & short term contract supplies
    - Highly Efficient Generation
  - 4% - from Real-Time market
- Solicitation for Renewable Resources
- Solar Pilot Program
- Commercial Energy Audits




**Glen Canyon Dam / CRSP**
- 4.3 MW SUMMER

**Parker - Davis Dams / Project**
- 10.4 MW SUMMER

# NERGY RESOURCES' PILOT
# OLAR CUSTOMER PROGRAM

- Began July 2012
- $/Watt incentive for REC's for Solar kWh produced
- FY2012/2013
  - $1.00/Watt Up-Front Incentive
  - $100,000 Program Budget for incentives
- FY2013/2014
  - $0.50/Watt Up-Front Incentive
  - $100,000 Program Budget for incentives
- FY 2014/2015
  - $0.20/Watt Up-Front Incentive
  - Residential - $50,000 or 50 kW, max 5 kW/$1,000 per installation
  - Commercial - $100,000 or 450 kW, max 75 kW/$15,000 per installation
- Net Metering
  - PV systems installed prior to Pilot are also eligible
- Results:
  - 11 Residential – 37 kW
  - 8 Commercial – 216 kW

# NERGY RESOURCES' DDITIONAL PROGRAMS

- Solar Powered Natural Gas SCADA installations
- Efficient Natural Gas Appliances (Space & Water Heating)
- Natural Gas Cogeneration at Water Reclamation Plants, Banner Desert Hospital
- Electric Vehicle Charging Stations
- Master planning & Business Development for District Cooling Utility System
- Compressed Natural Gas (CNG) Stations & Vehicles
- Solar Powered SCADA installations

Mesa Is Getting Greener

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Vehicle powered by compressed natural gas

MESA RECYCLES

Mesa's Fleet Is Going GREEN

MESA RECYCLES

Vehicle powered by compressed natural gas

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# ELECTRIC VEHICLE CHARGING STATIONS

- Partnership with Car Charging Group
- Chargers paid for through DOE grant
- 11 Car Charging Stations
  - Library
  - Mesa Arts Center
  - Convention Center
  - Main St. – Pepper Pl Parking Lot

# QUESTIONS ?

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# VERIZON WIRELESS LICENSE

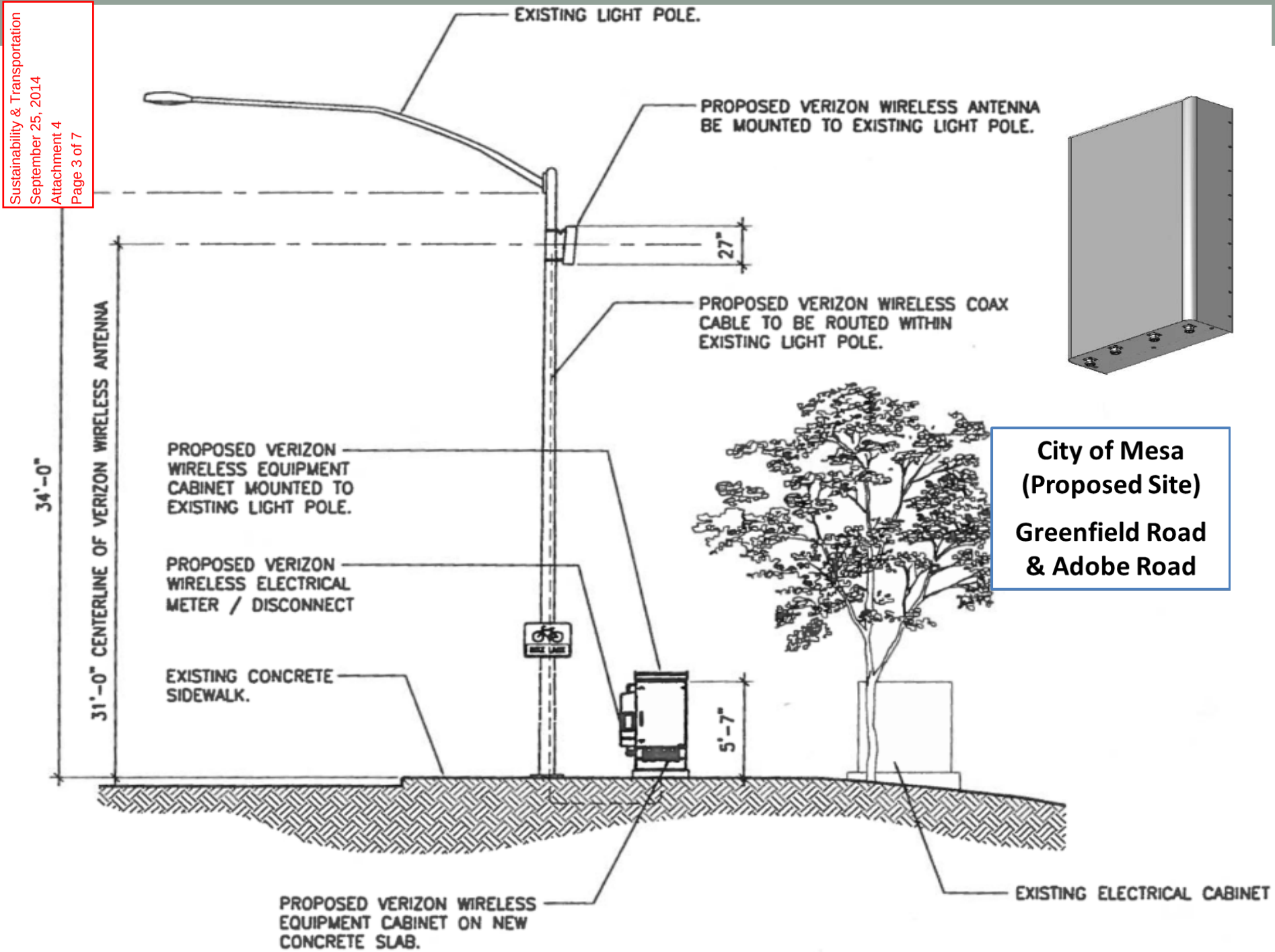
SEPTEMBER 25, 2014

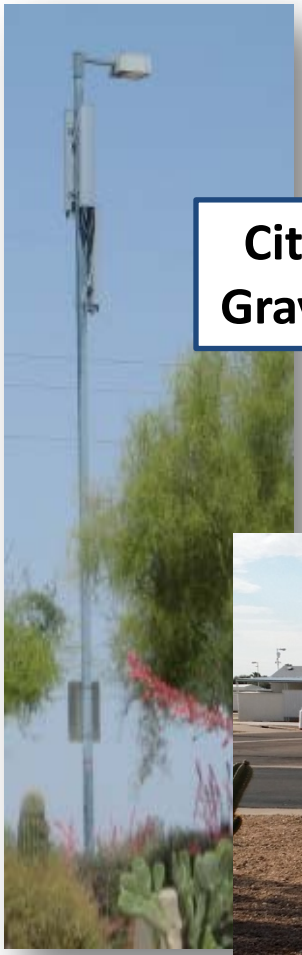
# VERIZON WIRELESS
# Wireless Antenna License

- Request to install wireless antenna on City owned streetlights
- Five year initial term with an automatic five year renewal and two optional five year renewals

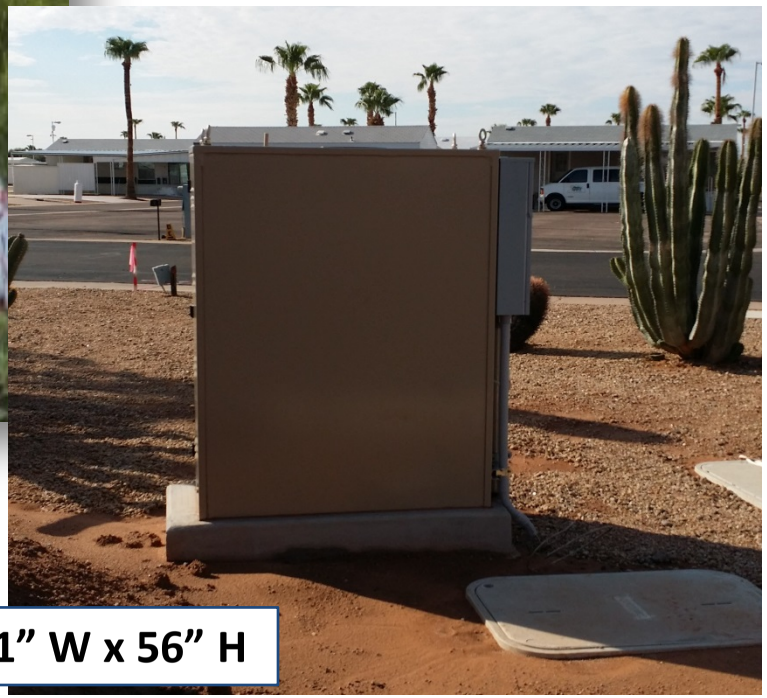
## Verizon Wireless will provide the City:

- Transaction privilege tax & permitting fees
- Annual rental rate


EXISTING LIGHT POLE.
PROPOSED VERIZON WIRELESS ANTENNA BE MOUNTED TO EXISTING LIGHT POLE.
27"
PROPOSED VERIZON WIRELESS COAX CABLE TO BE ROUTED WITHIN EXISTING LIGHT POLE.
34'-0"
31'-0" CENTERLINE OF VERIZON WIRELESS ANTENNA
PROPOSED VERIZON WIRELESS EQUIPMENT CABINET MOUNTED TO EXISTING LIGHT POLE.
PROPOSED VERIZON WIRELESS ELECTRICAL METER / DISCONNECT
EXISTING CONCRETE SIDEWALK.
5'-7"
City of Mesa (Proposed Site)
Greenfield Road & Adobe Road
PROPOSED VERIZON WIRELESS EQUIPMENT CABINET ON NEW CONCRETE SLAB.
EXISTING ELECTRICAL CABINET



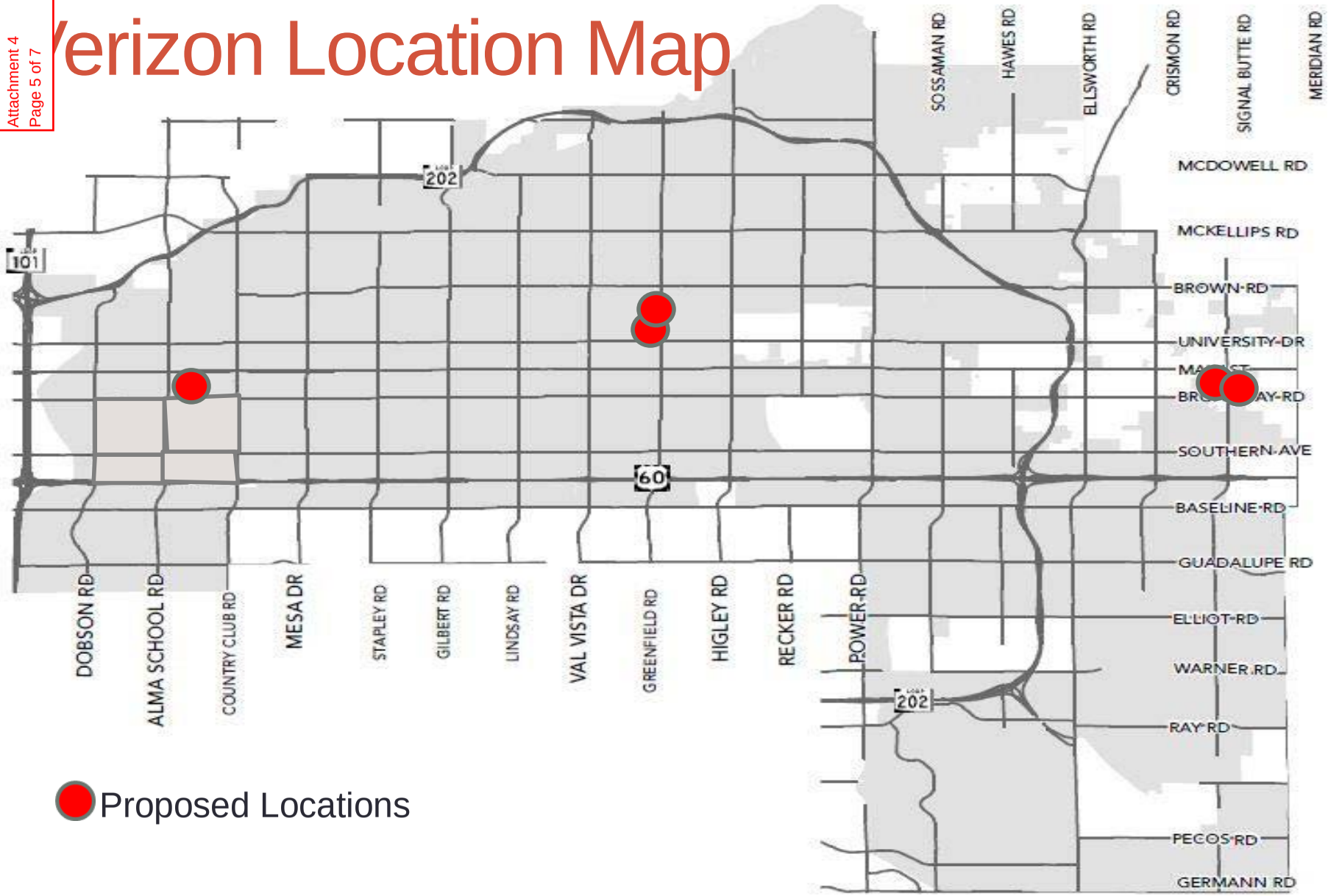
# City of Scottsdale – SEC Grayhawk and Scottsdale



**20” D x 41” W x 56” H**

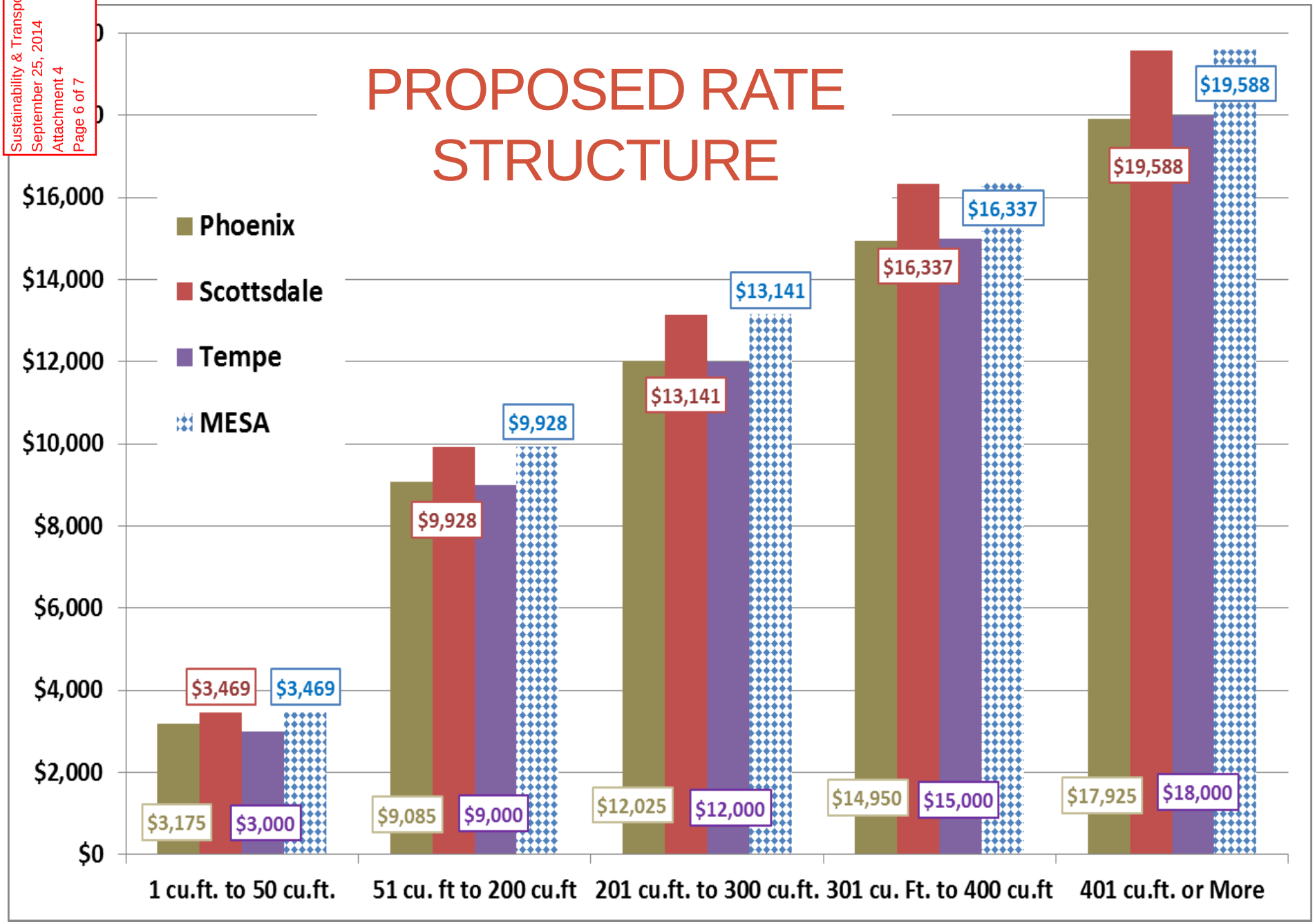
**Side View of Cabinet**

# Verizon Location Map




Proposed Locations

# PROPOSED RATE STRUCTURE



# QUESTIONS ?

# SAT Sept. 25, 2014

## PROPOSED REVISIONS TO TERMS AND CONDITIONS OF SALE OF UTILITIES OUTSIDE CITY LIMITS

- Water Resources Dept.
- Development and Sustainability Dept.
- City Attorney's Office

# PROPOSED REVISIONS

- Water Service Outside City Limits
- Modification, with conditions, of required development standards
  - One parcel for detached single residence
  - Multi-residence and commercial must comply with development standards prior to receiving service
  - Deferral of road, fire and water improvements until annexation
  - Requires Utility Service Agreement recorded against the property

# Terms and Conditions for the Sale of Utilities

- Establishes rules for sale of utilities
  - Currently, must comply with all City development standards
  - Annexation not required
- Utility Service Agreement Fee = Total of All Development Impact Fees

# Utility Service Agreement History

- Prior to 1996
  - Minimal conditions, payment of applicable fees
- 1996 – 1998
  - Development Agreement, develop to Mesa standards, payment of applicable fees
- 1998 – 2001
  - Development Agreement, develop to Mesa standards, payment of applicable fees and water and/or wastewater impact fees
- 2001 – Present
  - Utility Service Agreement, develop to Mesa standards, payment of water and/or wastewater impact fees and Utility Service Agreement Fee

# Council and Committee Reviews of Program

- 2007 – All properties required to Annex
- 2008 – Annexation Equity Fee established
- 2009 – Annexation not required if determined by staff not in City's best interest
- 2011 – Utility Service Fee (review of off-site conditions)
- 2012 – Off-Site Improvements (review of off-site conditions)
- 2012 – Review of Water Service Options for County Islands discussion (upheld current requirements)

# DEVELOPING TO CITY STANDARDS

- Dedication of Right-of-Way or PUFE for appropriate street grid.
- Construction of adjacent street improvements
- Meet Fire Code Requirements
- Construct all water lines necessary for pressure/flow needs

# PROPOSED CHANGES TO TERMS AND CONDITIONS

- Continue current policy of requiring a Utility Service Agreement,
- Staff evaluation of applications for compliance with City Standards but defer the following components until such time property owner requests annexation into the City of Mesa.
  - Construction of roadway improvements (eliminate in-lieu payments at time of utility service)
  - Installation of fire hydrants and water line extensions necessary to achieve fire flows: unless Water Resources determines there will be a detriment to water service or quality
  - If property does not comply with Fire access requirements, sprinklers in all building locations with no omissions would be an option

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# Recommendations Continued

- Delete Sections 3M and 3N – mandatory annexation is no longer part of the Council direction/policy

- 23. (Exceptions) replace A. to allow the City Manager or designee to modify improvement requirements except extensions of water lines adjacent to the parcel

- Provides for appeal of City Manager's decision to the Council Subcommittee

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# DIRECTION?

**If Modifications Approved:**

- **Council Introduction of Ordinance – October 6, 2014**
- **Council Action - October 20, 2014**

# Repurposed Pipe

Team INNOV8
Ideas That Make A Difference.

September 25, 2014

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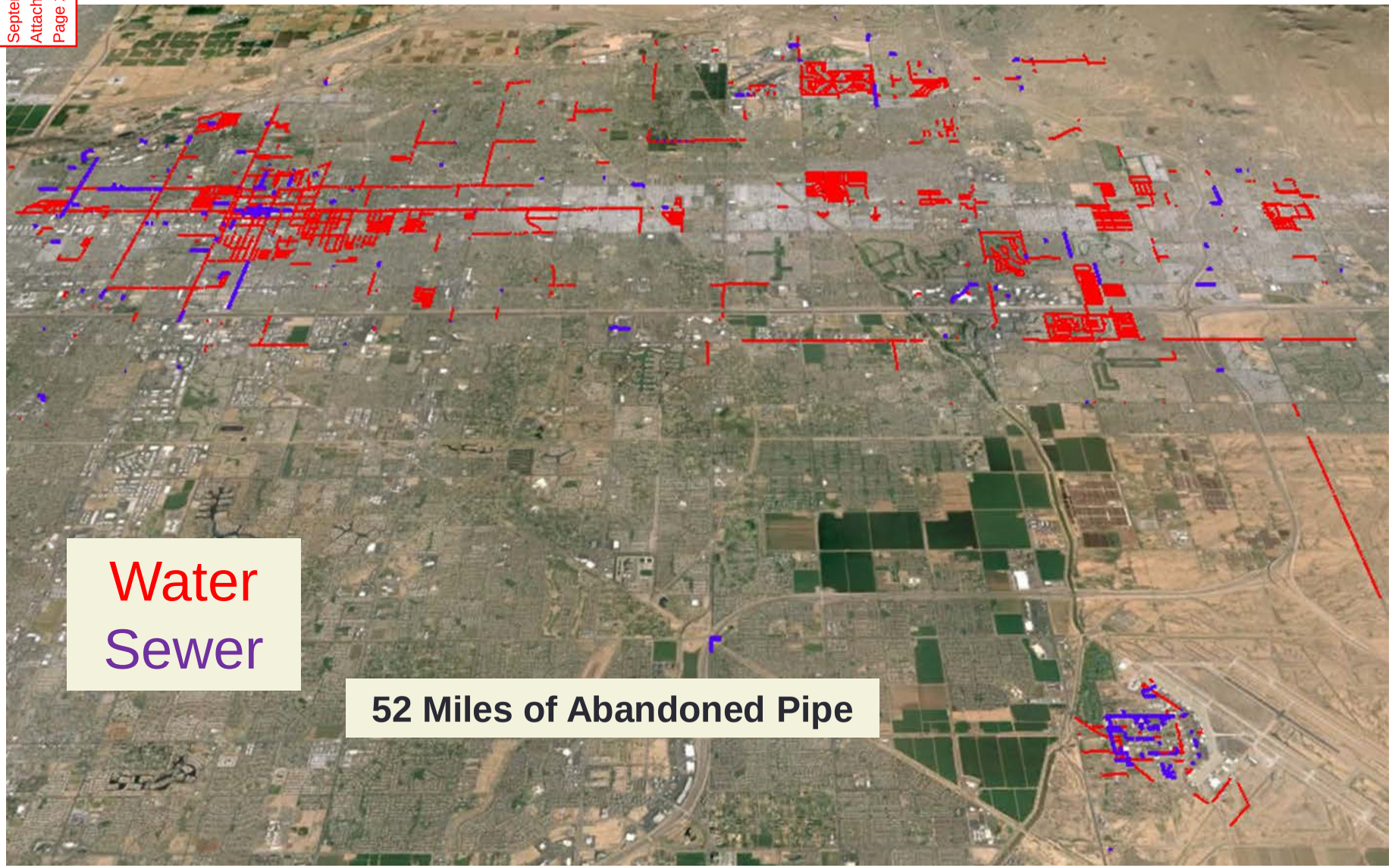
# Abandoned Pipe



# 38 Miles of Empty Conduit Available

# Benefits

- **Communications companies benefits:**
  - Reduced project costs and construction timeframes
  - Partnership opportunities with Mesa for Economic Development
  - Expanded Broadband to businesses and citizens

- **City of Mesa benefits:**
  - Reduce City fiber communications project costs
  - Decrease pavement degradation rate
  - Ease public inconvenience
  - Cost recovery for infrastructure – negotiated rate

# Implementation Schedule

## August-December

Inventory available assets

## August-October

Research and develop policies

Develop eligibility requirements

Create and standardize license agreements

Update abandoned pipe design standards

## October-January

Conduct staff training

Create marketing materials and website with maps of available assets

## January- Ongoing

Program Launch

Evaluation and Measurement

# QUESTIONS ?