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BEFORE THE ARIZONA CORPORATION COMMISSION

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IN THE MATTER OF THE APPLICATION OF ARIZONA PUBLIC SERVICE COMPANY FOR A HEARING TO DETERMINE THE FAIR VALUE OF THE UTILITY PROPERTY OF THE COMPANY FOR RATEMAKING PURPOSES, TO FIX A JUST AND REASONABLE RATE OF RETURN THEREON, TO APPROVE RATE SCHEDULES DESIGNED TO DEVELOP SUCH RETURN.	DOCKET NO. E-01345A-16-0036
IN THE MATTER OF FUEL AND PURCHASED POWER PROCUREMENT AUDITS FOR ARIZONA PUBLIC SERVICE COMPANY	DOCKET NO. E-01345A-16-0123

Arizona Corporation Commission
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REP America d/b/a/ ConservAmerica ("ConservAmerica") submits the Rate Design Direct Testimony of Paul Walker.

RESPECTFULLY SUBMITTED this 3rd day of February, 2017.

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By Jaclyn Howard

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Rate Design Direct Testimony
of Paul Walker
on Behalf of
ConservAmerica

February 3, 2017

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Exhibits:

Exhibit 1: ConservAmerica, "Solving the Solar Conundrum".

Exhibit 2: EIA Energy Consumption Chart

Exhibit 3: P. Walker, Insight Consulting, LLC, "The Challenge of Conservation: Jevons Paradox, the Samaritan Problem, & Utility Economics" 2010.

I. Introduction.

Q. Please state your name and business address.

A. My name is Paul Walker. My business address is 330 East Thomas Road, Phoenix, Arizona 85012.

Q. Are you the same Paul Walker who submitted revenue requirement direct testimony in this case?

A. I am.

Q. And has anything changed with regard to your background, qualifications, or employment since that prior testimony was filed?

A. No.

Q. And has anything changed with regard to ConservAmerica's activities and accomplishments?

A. No.

Q. Can you provide an overview of your testimony?

A. ConservAmerica intervened in this case to support the continuation of APS's Solar Partners Program, and to encourage the Commission to approve APS's proposed change to rate design, that is, the introduction of demand charges for residential service.

This case is vitally important because Arizona has the opportunity to set the precedent for America's energy future.

Demand charges are simply an idea whose time has come. With Automated Meter Infrastructure, utilities have data they never could have imagined a decade ago. And yet, America continues to rely on rate designs from the 1980s. The current volumetric-based rate design is antiquated and does not reflect the current reality of increased rooftop solar deployment and falling kilowatt-hour use.

Q. But doesn't the kilowatt-hour measure customer usage?

A. We have to stop pretending that customers are buying kilowatt-hours when they pay their electric bill. They are not; they are buying a bundled service and the vast majority of utility costs are fixed costs that exist regardless of kilowatt-hours. We used, historically, kilowatt-hours as a measurement device when we lacked more data than that, and we applied inverted tiers to kilowatt-hour charges as a means of incenting conservation. In reality, a rooftop solar customer with no billed kilowatt-hours still uses the grid constantly. What we need is a rate design that better reflects the costs of the different elements of the electrical service.

A three-part rate design, including a monthly customer charge, a demand charge, and a volumetric charge, sends more accurate price signals to customers. Pretending that a measurement device is the product makes no sense at all, e.g., people buy foods not weights. And true conservation requires price signals that create not only a disincentive to expensive choices—much more importantly, pricing signals create market opportunities for better choices. I will explore all these concepts in greater detail in this testimony.

Q. Will existing rate design models handle the challenges being created by higher penetration levels of Distributed Energy Resources (DERs)?

A. Emphatically, they will not. In fact, they will make the situation worse. PUCs, including the Arizona Corporation Commission, have relied on a rate design with relatively low monthly customer charges, with the remainder of the revenue requirement recovered through volumetric kilowatt-hour charges. PUCs relied on that approach because low fixed charges made electricity more affordable for low-income households and volumetric charges shifted more of the revenue requirement to wealthier, higher power-consuming households. That approach comports with one of Bonbright's rate design principles, achieving social equity. However, what it does in a rooftop solar world is it increases the likelihood of wealthier homes being attracted to rooftop solar—and that has occurred. What that means is that the costs of the grid are already shifting more and more toward lower-income and non-solar households.

Continuing to rely on that 1980s approach in the face of 21st Century technology is a recipe for disaster: Not just for the grid, but for low-income households. They all pay taxes, and many of them pay surcharges to fuel rooftop solar—but those benefits flow to wealthier homes and make their switch to rooftop solar more likely; blue collar families are funding the very changes that increase their own utility bills while the wealthier homes move away from paying their fair share of the costs. As that occurs, the costs of grid maintenance and meeting utility revenue requirements increase on the non-solar homes. This is exactly the opposite of social equity.

II. <u>The current rate design is broken—it doesn't reflect the solar cost shift and it subsidizes the wealthy at the expense of the poor.</u>

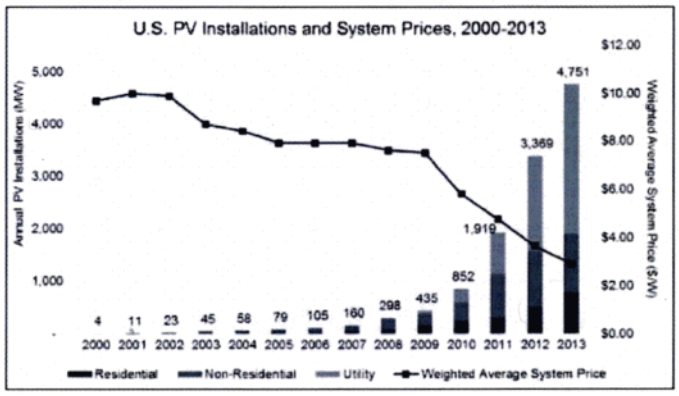
Q. Why should the Commission approve demand charges and the continuation of APS's Solar Partners Program?

A. Both demand charges and the Solar Partners Program reflect the current world that exists. First, demand charges address a fundamental challenge that exists today and is growing more challenging: That is, how do we plan to keep the electric grid functioning with increasing levels of distributed energy resources (power production and storage)?

Second, what ConservAmerica calls "Blue Collar Solar" is embodied in APS's Solar Partners Program and it addresses a second challenge that exists today and is growing more challenging: That is, how do democratize rooftop solar?

Q. Taking the first challenge, first, as it were; what is happening to the grid as a result of increasing Distributed Energy Resources ("DERs")?

A. The grid is being changed by the increase in rooftop solar. Solar panels have seen a price fall of 70 percent during a time period in which public utility commissions expanded programs requiring utilities to emplace more solar into their generation mix.[1]



Source: Green Tech Media

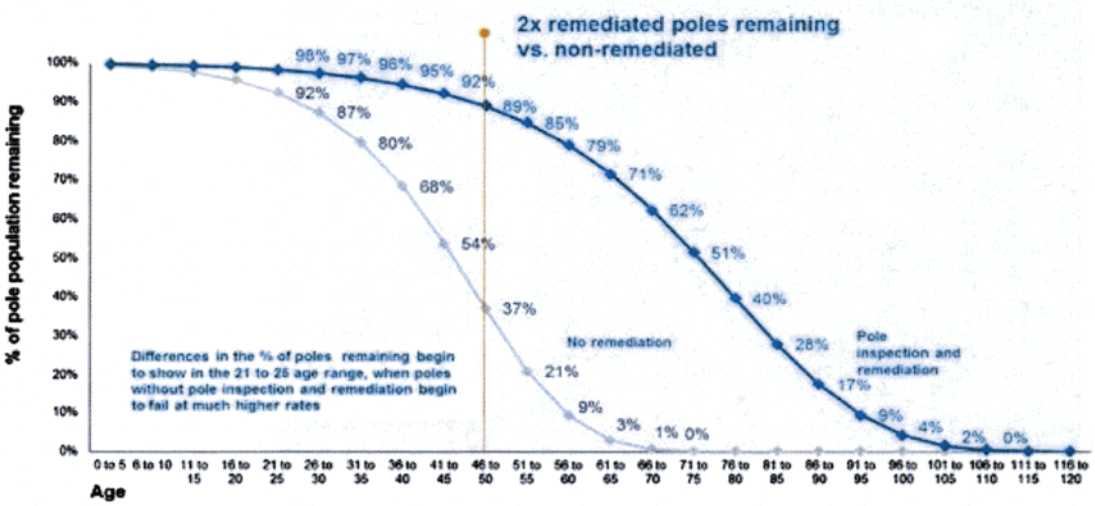
[1] ConservAmerica, "Keeping the Lights On", page 7.

This increase in rooftop solar results in a couple significant changes: First, it is being emplaced predominantly on the larger, wealthier homes—which under a volumetric based rate design sharply reduces their financial contribution to utility required revenues. Those costs are already being shifted to non-solar homes. As APS makes clear in its testimony, the proposed rate increase on residential customers is 1.25% higher solely because of the cost shift from solar residential and commercial customers to non-solar residential and commercial customers combined and that cost-shift already totals $42.7 million annually.

Second, it is changing the function of the distribution system. Power is now flowing onto the distribution system which has not occurred in the past. The distribution system in America is generally the oldest component of the grid. 92 percent of the 450,00 in-service poles with no remedial treatments are over 26 years old.

450,000 in-service poles with no remedial treatment

150,000 in-service poles with previous remedial treatment



Decay rates used in analysis are based off projections using a general linear model with a logistic link function and binomial variance

Source: Oliver Wyman analysis, Osmose 600k Wood Pole Survivor Rates by Decay Hazard Zone Initial Inspection vs. Recycle Inspection

Those two changes mean that costs of maintaining the grid are increasingly being shifted to non-solar homes from the wealthier solar homes; and that the costs of dealing with those new distribution-level power flows will have to be addressed if we want to keep the grid functioning.

Q. So, if the Commission continues to rely on its existing rate design approach, low-income and "blue collar" households will pay more and more of the costs while wealthier, solar homes pay less?

A. Exactly. It is disingenuous for certain solar advocates to continue suggesting that higher fixed charges and demand charges are intended to hurt lower income households. Literally the opposite of that is true: Blue collar households are paying more and more of the costs of the grid than they should under cost of service approaches (according to APS, to the tune of $42.7 million a year in this case alone). With demand charges and higher fixed charges, a great deal of that cost-shift will be recovered. Demand charges and higher fixed charges are the only <u>currently</u> viable ways I know of that can address the cost-shift problem and the cost-shift spiral that is underway.

Those who cannot afford rooftop solar are being forced to pay more in this case because of the cost-shift; and the cost-shift spiral will only make that worse. Continuing to rely on low fixed charges and high volumetric charges only increases the pace of wealthier homes adopting rooftop solar. Leaving demand charges out of the regulatory equation only allows wealthier, solar homes to continue using the grid without paying the full costs of their reliance on the grid. And those costs have to go somewhere…

Furthermore, unless we increase the use of Blue Collar Solar programs like APS's Solar Partners Program, we will continue to leave blue collar households out of the rooftop solar approach altogether.

Finally, with regard to future approaches—the Commission needs to carefully monitor and eventually adopt "nodal pricing" that accurately values the impact and the benefit of DERs. ConservAmerica's approach is embodied in "Solving The Solar Conundrum",[2] attached to this testimony. It is not attached as a call to immediate action—but rather to provide the Commission with a perspective on the next generation of utility rate approaches. Three utilities are already piloting nodal pricing models; one Fortis company in New York, Southern California Edison, and one in Canada.

The Commission should carefully review the results of those pilot programs and begin to host stakeholder meetings on the results and the potential to follow suit in future ratemaking proceedings.

Q. Are there others beside ConservAmerica and APS who have expressed similar concerns with social equity?

A. Not enough, in my opinion, but those who have looked at the issue are rightly concerned. For example, the Electric Markets Research Foundation published a white paper titled "Changing Uses of the Electric Grid: Reliability Challenges and Concerns" on July 10, 2015.[3]

In one section, they looked closely at the impacts of deregulated electric markets and became concerned with social equity—their worries are directly applicable to the issues Arizona faces with regard to rooftop solar adoption under an antiquated 1980s-era rate design in a 21st Century world:

> Might this lead to two societies? A privileged minority has the financial ability and inclination to work around grid-based electric service. They may choose a new supplier for their electricity needs, or they may lease a

[2] Attached as Exhibit 1.

[3] http://www.emrf.net/uploads/3/1/7/1/3171840/emrf_business_models_final_web_version.pdf

> rooftop solar system from a third-party solar developer. Or if they have multiple office buildings, they may build a microgrid to serve their office park. As this minority opts out, the remaining majority may be left holding the bag, left dependent on the utility grid which now has less revenues to pay for its upkeep or expansion.[4]

In this case, APS has already demonstrated that the remaining majority is picking up $42.7 million a year in costs shifted from rooftop solar customers. They will pay an extra $1 billion if we stay on our current, outdated rate design model.

III. APS's proposed demand charges in context.

Q. What is your understanding of APS Application in this case?

A. APS has filed its first rate case in five years. It is seeking "an increase in base rate revenue of $165.9 million, or 5.74%, net of existing adjustor mechanisms".[5] APS highlights that "[d]ramatic changes are occurring in the electric utility industry, from environmental regulations to low natural gas prices to the opportunities afforded by distributed technologies".[6]

To respond to and effectively manage those changes in a manner that allows APS to continue to deliver safe, adequate, and reliable power at affordable and fair rates, APS believes it "must build, operate, and maintain a flexible grid that enables customer choices."[7]

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[4] Electric Markets Research Foundation, "Changing Uses of the Electric Grid: Reliability Challenges and Concerns", July 10, 2015 at Page 15

[5] APS Rate Application, Page 1, Lines 24-25.

[6] Ibid, Page 2, lines 3-5.

[7] Ibid., Page 2, Lines 8-9.

I agree wholeheartedly. In "Keeping the Lights On: Understanding and Security the North American Electric Grid,"[8] which I co-authored, ConservAmerica wrote the following:

> With wind and solar power continuing to increase their share of generating capacity, managing the system is becoming more complex; and more costly. This is not a critique of distributed energy – certainly, the U.S. will and should continue to emplace distributed energy; however, the economic maxim, "there is no such thing as a free lunch" applies. Distributed renewable energy systems create power flows in distribution systems that did not exist before rooftop solar; many neighborhoods are served by aging distribution systems (see chart [below]). Those older distribution systems are having, and will continue to have, challenges with handling power flows heading in the opposite direction. The Edison Power Research Institute, and utilities in Hawaii and Arizona are in the midst of a comprehensive study of distributed energy and distributed storage; and the impacts those technologies will have on grid reliability.[9]

An essential component of APS' request is that the Arizona Corporation Commission modernize rate design to encourage new technologies while reducing the cross-subsidy currently embedded in rates, APS explains the conundrum as follows:

> Current residential rate design sends inaccurate price signals to new technologies, making it more difficult for those new technologies to be viable options for customers. Current residential rate design also creates inequitable cost shifts between customers.
>
> In this rate case alone, the proposed rate increase on residential customers is 1.25% higher solely because of the cost shift from solar residential and commercial customers to non-solar residential and commercial customers combined already totals $42.7 million annually... Assuming grandfathering [of existing rates for existing solar customers] rooftop solar subsidies over [solar panels' expected] 20-year life… the total 20-year subsidy will exceed $1 billion. Moreover, these numbers do not take into account the over $800 million in cash incentives paid and committed to residential and commercial customers over the last decade".[10]

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[8] http://conservamerica.org/wp-content/uploads/2016/10/ConservAmerica_Keeping_The_Lights_On_2016.pdf

[9] ConservAmerica, "Keeping the Lights On", Page 7.

[10] APS Rate Application, Page 10, Lines 7-19.

Q. What is your understanding of APS' proposal regarding demand charges?

A. As explained by APS in its Application:

> Demand offers a third way for customers to save money on their electric bill, and it shows. In a study on this issue actual data show that 90% of customers sampled saved money after transitioning to a demand rate. [FN4] Successfully bridging to a sustained future of clean energy requires a rate structure that isn't built on subsidies, but instead incentivizes the most efficient technologies. For the benefit of all customers, and to unlock the promise of future technologies, we must transition to demand rates." [Emphasis added][11]

IV. Demand charges address the solar cost shift and send appropriate price signals.

Q. What is your view of demand charges?

A. Demand charges are a concept whose time has truly come—across the U.S. electricity consumption is barely moving upward, increased efficiencies in home building, insulation, HVAC systems, appliances, and the growth of smart thermostats like the Nest, have slowed demand growth. These are positive developments, but we must modernize our rate design to reflect these changes.

The U.S. Energy Information Administration ("EIA") data on this is more than compelling. Attached to this testimony is a chart from the EIA's database—I have changed the formatting by eliminating non-relevant columns and rows, but included on the chart the url for the full Excel spreadsheet.

As one can clearly see from the chart, the EIA recognizes that electric demand in the U.S. is no longer growing as it did in the past—in fact, EIA's projection for Residential Total

[11] APS Rate Application, Page 12, Lines 16-21.

Energy Consumption between 2016 and 2050 is that it will decline from an average of 178.0302 MMBtu/household in 2015 to 127.4321 MMBtu/household by the year 2050.

One of the drivers of that trend, though not the only one, is the increase in Residential Solar Photovoltaic, which EIA expects to increase by 9.70 percent in that timeframe; another is the increase in Residential Solar Hot Water Heating, which EIA expects to increase by 2.80 percent in that timeframe.

Additionally, the growth of distributed renewable energy production (primarily, rooftop solar) has created dramatic changes in demand curves. What has happened is this: Demand during the daytime has been reduced through efficiency and demand is increasingly being met during the daytime hours by distributed energy systems at the customer level. Demand has shifted: When the sun begins to set, customers begin to return home, and demand is now larger in many utilities (including APS) in the late afternoon to early evening hours.

What is rational is to see the world as it really is… Today's energy consumption is different than it was before solar panels became ubiquitous, and their ubiquity came from the massive decrease in their price. But that isn't the whole story of electric consumption changes; appliances have become dramatically more efficient, HVAC systems as well. And while Jevons' Paradox[12] remains in many, many areas of the economy, there really isn't much more electric demand that consumers want or need—no matter how efficient

[12] Jevons Paradox. Origin, Stanley Jevons, *The Coal Question* (1865), available at http://www.econlib.org/library/YPDBooks/Jevons/jvnCQ0.html. Mr. Jevons predicted (correctly) that the Watt steam engine's incredible leap in efficiency would not reduce coal consumption, but would increase it because the efficiency alone would lead to more demand for coal. Jevons Paradox is a fundamental issue in resource economics—measures incenting efficiency often lead to more use of the resource initially intended to be conserved. *See, e.g.*, my 2010 presentation "The Challenge of Conservation: Jevons Paradox, the Samaritan Problem, & Utility Economics", attached as Exhibit 3.

the HVAC system becomes, people don't want to cool their homes to 50 degrees in summer, nor heat them to 90 degrees in the winter. We have moved beyond Jevons' Paradox with electricity consumption; and with the scientific reality of climate change, we must continue to rapidly transition to cleaner energy.

Q. Can't that demand shift be resolved through time-of-use charges?

A. Time-of-use charges certainly help but the focus on the kilowatt-hours aspect of electric utility service. We need to also deal with the infrastructure requirements of electric utility service. You can meet kilowatt-hour demands by burning more fuel; but peak demand requires infrastructure. And that is where demand charges come in—they don't replace or obviate the need for time-of-use rates; demand charges can work with time-of-use rates. Combined then, they send pricing signals to customers to do two things: ***First, watch when they use power; and second, watch how much power they use at once***.

Q. Why should Arizona adopt demand charges?

A. If we continue on our current course, relying on 1980s rate design which uses a fixed basic service charge and a per-kilowatt-hour consumption charge we will create a very odd electric system. It will be characterized by large generation stations idling during the day; or worse for nuclear plants that cannot idle or reduce output, having to pay others to take their energy. [See, e.g., the western United States, wherein California ratepayers are paying utilities outside of California to take their excess daytime power.] Utilities, and the PUCs that oversee them, will have to choose between paying others to take excess power (driving up rates), or shutting down highly efficient large-scale generators and replacing them with peaking capacity like natural-gas fired combustion turbines (which sell at a very high marginal cost and are the highest-emitting natural-gas fired generators in existence.)

That course is costly and would only serve to increase emissions by idling zero emissions nuclear plants and increasing reliance on inefficient combustion turbines. As costs went up, we would continue to see customers of means shifting to rooftop solar systems; stranding lower-income customers with the growing legacy costs of the utility. And the rooftop solar customers would still rely on the utility for power in the late afternoon and early evening hours. Some of the wealthier customers would then add home energy storage solutions, and further decrease their utility bills, while again stranding lower-income households with more and more of the legacy costs.

There is a better path.

Demand charges need to be added to rate design structures. Demand charges better reflect the way customers use and will increasingly come to use, the electric grid.

Q. Do demand charges comport with utility regulation theory?

A. They do; Professor James Bonbright's *Principles of Public Utility Ratemaking* is one of the most cited and most authoritative books dealing with the economics of utility regulation. In Chapter IV, "Cost of Service as the Basic Standard of Reasonableness", he explained "The Three-Fold Rationale of a Cost-Price Standard" as follows:

1. Consumers should be free to enjoy whatever amount of service they want, so long as they are ready to pay for the costs of that consumption,
2. Utilities should be motivated and enabled to supply the service in the amount demanded, and
3. Rates should ensure that those who use more, pay more than their direct costs as a means of income distribution.[13]

[13] In Chapter VIII, in the "THREE TYPES OF FAIRNESS STANDARDS", he explained this last point further: Income-Distributive Standards, he explained, should "minimize the cost burden on those consumers with the lower incomes."

Under modernized rate design, which would include basic service charges, volumetric charges (based on time of use), and demand charges, consumers will see accurate pricing signals. And because the consumers will see accurate pricing signals, the market will have real opportunities to introduce new products and services.

Demand charges, properly designed, correctly explained, and gradually implemented, will provide APS with the revenue it requires to meet customers current (and future) demand; and will create price signals that will allow customers to select products (like Nest systems, home energy storage, and load controllers) that reduce their utility bill ***because they reduce the utility's cost of service***.

APS has it right when they explain that:

> The pace of change is accelerating in many aspects of our lives and the generation and delivery of energy is certainly no exception. Customers are increasingly utilizing new technologies to better control their use of energy. Sending the right price signals will help customers make informed decisions about the types of technology that will lower costs for everyone… A modernized pricing structure will allow APS to continue investing in [its] communities and updating infrastructure to maintain reliability, support emerging technologies, and create a cleaner energy [future for its] customers and Arizona.[14]

Q. But don't you claim to be pro-solar? How can you support demand charges?

A. Demand charges are not incompatible with solar. Utility-scale and community solar investments are fixed costs that are well-suited for recovery through demand charges. The same is true for utility investment in rooftop solar.

Nor are demand charges incompatible with third party rooftop solar. It's true that not every current third party rooftop solar business model works well with demand charges.

[14] APS, "Bridge to the Future", Attachment 1 to APS Rate Application, at Page 2.

But there is still a strong value proposition for rooftop solar—any reasonable three-part rate design still includes substantial volumetric charges—charges that can be avoided with rooftop solar. It's just that the avoided charges will better line up with the actual avoided costs.

Further, demand charges also create the opportunity for innovative products and services that allow customers to reduce demand, and thus avoid the demand charges. Such innovations can be coupled with rooftop solar to avoid demand and volumetric charges. For example, rooftop solar can be coupled with storage or with demand controllers. Such innovations will be encouraged by the price signal sent by a demand charge.

Ultimately, rates should align with cost causation, so that prices send the signal to avoid costs. Under current conditions, the old volumetric-heavy rate design no longer does this. The current rate design shifts ever more costs from wealthier rooftop solar customers—who still use the grid and still cause fixed costs—to poorer non-solar customers. This is not sustainable in the long run. Maintaining the current rate design may benefit the short term profits of some rooftop solar companies, but a true move to lower emissions—and eventually to a zero-emissions electric system—will require a fair rate design that is sustainable in the long run.

Q. Some argue that demand charges are simply an old idea dressed in new clothing. How do you respond to that?

A. I would respond by pointing out that innovative ideas are often rejected early, only to be realized later, to wit:

1. "In the late 1890s, engineers had ideas about uniting a gasoline engine with an electric motor. In 1899, 21-year-old Ferdinand Porsche built a gasoline-electric hybrid vehicle."[15]
2. "In August 1981, Honda dealers in Japan offered what Honda claims were the first-in-car navigation systems."[16]
3. "The laws of physics can't be defeated, but they can be counteracted. And that's what Nissan's Infiniti division tried in 1990 with the Q45a. This big car was the first production car with a computer-controlled, hydraulically operated suspension system… Today, suppliers such as Germany's ZF Friedrichshafen and Delphi of the US have developed active suspension systems that do the same thing".[17]
4. "The first fax process was patented in 1843 by Alexander Bain, but fax machines went into service only in 1964… Eugene Ely landed a plane on a boat in 1911, but aircraft carriers weren't perfected for another 20 years… Leonardo daVinci had made detailed sketches of parachutes in 1485… The computer was launched in 1943, more than 100 years after Charles Babbage designed the first programmable device… The Compact Disc was invented by Joop Sinjou and Toshi Tada Doi in 1979. It took the CD fifteen years to replace the LP."[18]
5. "SixDegrees.com was the original online social network, based on the game "six degrees of Kevin Bacon" and the idea that we're all six degrees away

[15] Automotive News Europe, "Ideas Ahead of their Time", April 17, 2006.

[16] Ibid.

[17] Ibid.

[18] www.didyouknow.org, "Untimely inventions – products before their time."

from everyone on Earth. It had high growth from its start in 1997 but people probably weren't ready for a full-fledged social network."[19]

6. "AskJeeves actually had many things that made Google huge… It actually included many of the techniques that later made their way into Google, like semantic search (understanding natural language queries) and even ranking web pages by hyperlinks, which is Google's secret sauce."[20]

7. "LoudCloud was the second startup by Netscape's visionary founder Marc Andreesen, and it was a bit too visionary. It did what Amazon and others do today: provide cloud computing services to startups and big companies. It was just too early to market and had to change its business to data center operation and its name to Opsware."[21]

Q. Any other response to the argument that demand charges are simply an old idea dressed in new garb?

A. The technology didn't exist in the 1980s to provide the data that we have today: That DaVinci first designed parachutes in 1485 did not mean that parachutes were unnecessary or irrelevant when airplane flight began in the 20th Century. Similarly, the fact that demand charges were previously considered thirty years ago has no relevance to whether demand charges in today's technology work; or whether demand charges will send price signals to both reduce demand (lowering emissions) and incent innovation (creating 21st Century products and services to manage electric usage).

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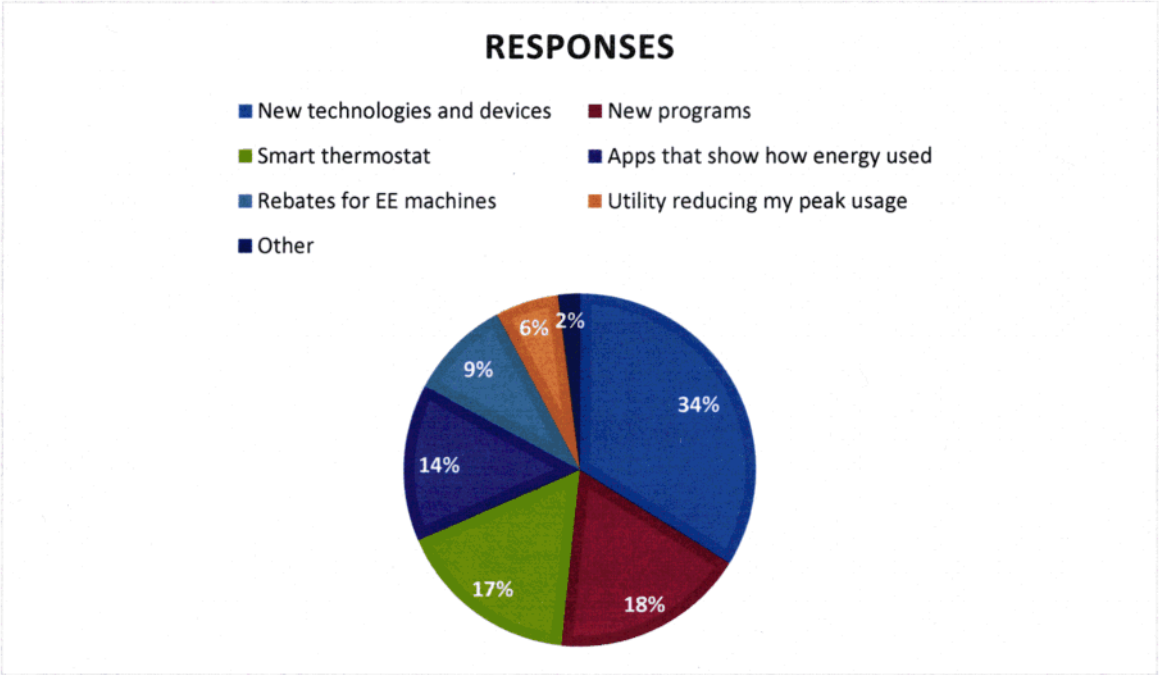
[19] Business Insider, "10 Brilliant Startups That Failed Because They Were Ahead of Their Time", May 4, 2011.

[20] Ibid.

[21] Ibid.

Q. Is there any evidence that customers are seeking "innovation (creating 21st Century products and services"?

A. A report issued by Smart Energy IP in June 2015, titled, "Engaging the Small to Medium-Sized Business Through Smart Grid Customer Education"[22] had many findings on that customer class' interests, but one finding jumped out at me: They polled 707 small to medium-sized businesses on "what types of programs, devices or technologies would be most appealing right now?"



The fact is, demand charges provide not only the incentive but also the measurement tool that would drive innovation for all of the things those customers are looking for from their utility.

And importantly, demand charges do not enrich the utility—nor do they limit new market entrants from providing nearly all of those solutions that business owners are seeking.

[22] http://www.smartenergy-ip.com/pdf/Engaging%20the%20Small%20to%20Medium-Size%20Business%20Report%20FINAL.PDF

Q. Is now the time for such a change?

A. Indeed it is. Again, we already are at $42.7 million a year in cost-shift. That number won't be getting smaller—and the majority of Arizonans aren't getting wealthier than the privileged minority—as was shown in my earlier testimony in this case, "a study by the Economic Policy Institute found that between 2009 and 2011 the share of the total gain in income growth by the top 1 percent of Arizona households was 686 percent higher than the bottom 99 percent."[23]

Most of the Congressmen and women I speak with, and Commissioners throughout the United States are concerned with the long-run impacts of wealth inequality—now, for sure, one's political ideology may lead one to different solutions to that problem, but my point isn't how to address wealth inequality—it's how the Commission should structure rates in a DER world to ensure that rates aren't shifting more costs from the wealthiest to the blue collar customers. Demand charges do that—and, properly structured, demand charges can and should shield low-income households from demand charges.

ConservAmerica believes that demand charges should be implemented with carve-out protections for very small demand customers and low-income customers. Furthermore, we believe that the initial demand charges for the remaining customers should be large enough to be noticed, and small enough that they won't cause any financial crisis. Certainly, that number is "in the eye of the beholder" but we believe that Arizona Community Action Alliance, the Arizona Solar Deployment Alliance, RUCO, and Commission Staff are the most appropriate parties to work with APS to determine the appropriate level.

[23] P. Walker, Direct Testimony on Revenue Requirement, December 22, 2016, at Page 12.

V. Demand charges as a policy reform.

Q. Have you been involved with significant regulatory reforms in the past?

A. Yes, as the Chairman of Arizonans for Responsible Water Policy, I worked with the water industry to craft a proposal to reduce regulatory lag, reduce rate case expenses, and begin improving Arizona's water and wastewater infrastructure through the use of Distribution System Improvement Charges ("DSICs"). Ultimately, the Commission directed us, in a litigated format, to negotiate with Commission Staff and RUCO to develop a DSIC approach for Arizona. The System Improvements Benefit Mechanism was the result.

Additionally, I worked for 12 years to get the Commission to consider a complete review of its regulatory practices regarding the water and wastewater industry. That process resulted in the Commission's actions this past summer Decision No. 75626 (July 25, 2016), which reformed several practices, and adopted new policies for rate design, cost of capital, and consolidating the Arizona water sector.

Q. What are some of the key characteristics of a successful reform?

A. First, public policy's fundamental prerequisite is transparency. Every affected person or party should be aware of the issues under consideration and should have the right to participate in the process that evaluates options and results in change.

Second, policy reform in the utility sector should be based on gradualism. Customers and investors alike share an aversion to whip-saw changes. So when new policies and practices are adopted they should be mindful of the need to allow customers and investors time to adapt to the new paradigm.

Finally, changes to customers rates should always emplace rate gradualism – the costs of utility service, in all sectors, are only going to increase over time; but we have to be mindful that customers' incomes don't adjust because of those cost drivers. People see small changes in their income most of the time – so rate changes should be structured to send appropriate price signals that affect behavior and encourage the market to innovate without forcing customers into personal financial crises.

Q. With those factors in mind, what do you believe would define a successful change to electric rates that emplaced demand charges?

A. First, do no harm. The move from 1980s-style rate design to 21st Century rate design does not have to hurt ratepayers, and the Commission should ensure that it doesn't by establishing the following requirements:

1. Make demand charges revenue neutral. This is important so that customers understand, clearly and unequivocally, that demand charges are not increasing the utility's profits. Rather, they should be simply another way of recovering the same revenue requirement, but in a way that more closely tracks the utility's costs, especially the costs of serving a low kWh customer.
2. Make sure the transition occurs over at least six months—during this time, customers should be receiving graphically heavy bills that show what their current usage pattern would mean for their bill if demand charges were in effect. For customers whose usage shows a significant change would occur under demand charges, the utility should provide access to information and tools to help them begin changing their behavior before demand charges go into effect.
3. Don't make demand charges huge. I am an advisor to a financial services company focused on serving America's unbanked population (Pocket Teller), at Pocket Teller we are keenly aware of two major realities about the economic status of American households. First, in 2014, The Economist magazine found

that 70 percent of U.S. households would have to borrow money or sell something if they were hit with an unexpected expense of $400. In 2016, PBS' NewsHour collaborated on a second study that found that 50 percent of U.S. households have no solution for an unexpected expense of $1,000. The average American family continues to struggle financially and they cannot withstand large unexpected expenses. Of course, this isn't a problem with demand charges alone—an unexpectedly high bill due to high kWh presents the same problem.

VI. Summary.

Q. Please summarize your testimony.

A. Demand charges are an idea whose time has come. We must modernize our rate design to reflect significant changes in our electrical system, including reductions in kilowatt-hour use and increasing rooftop solar penetration. In an electrical system characterized primarily by fixed costs, excessive reliance on volumetric rate design sends poor price signals and shifts costs to innocent customers. A reasonable and balanced rate design including demand charges will provide a stable and fair way of recovering the costs of the grid we all rely as we transition towards a reduced emission (and ultimately emission free) electrical system.

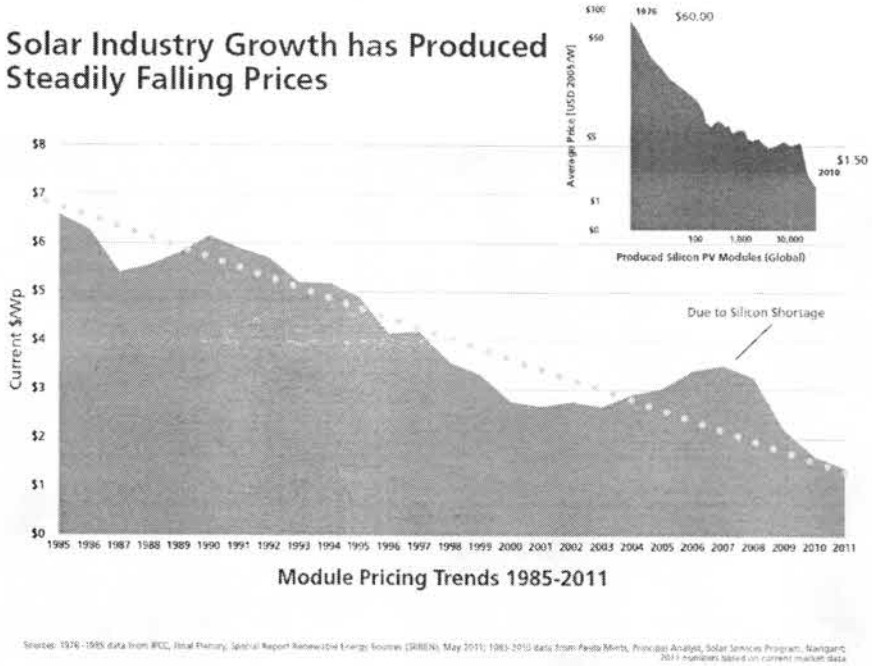
Exhibit 1

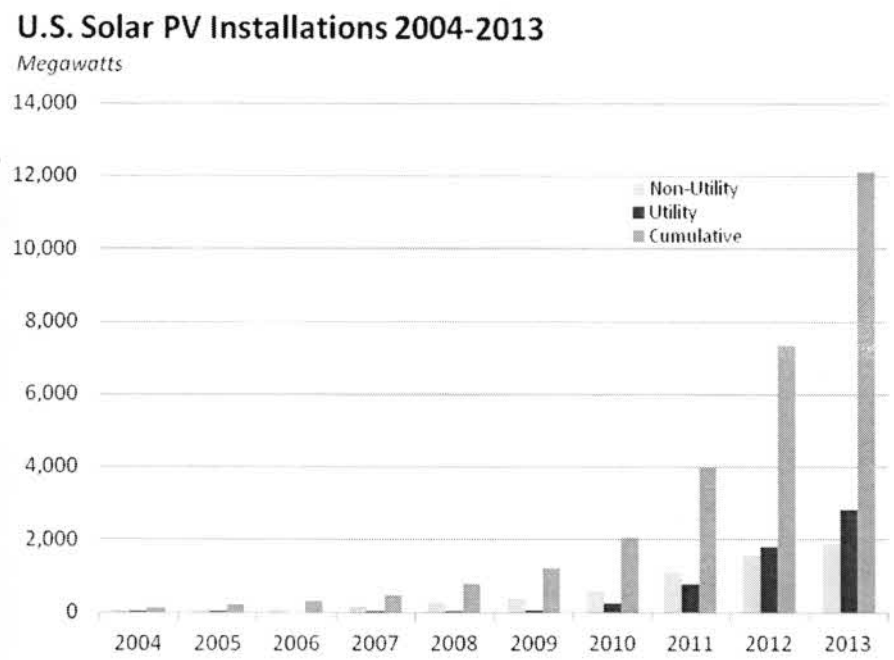
ConservAmerica

SOLAR'S IMPACT ON THE GRID

THE SOLAR CONUNDRUM

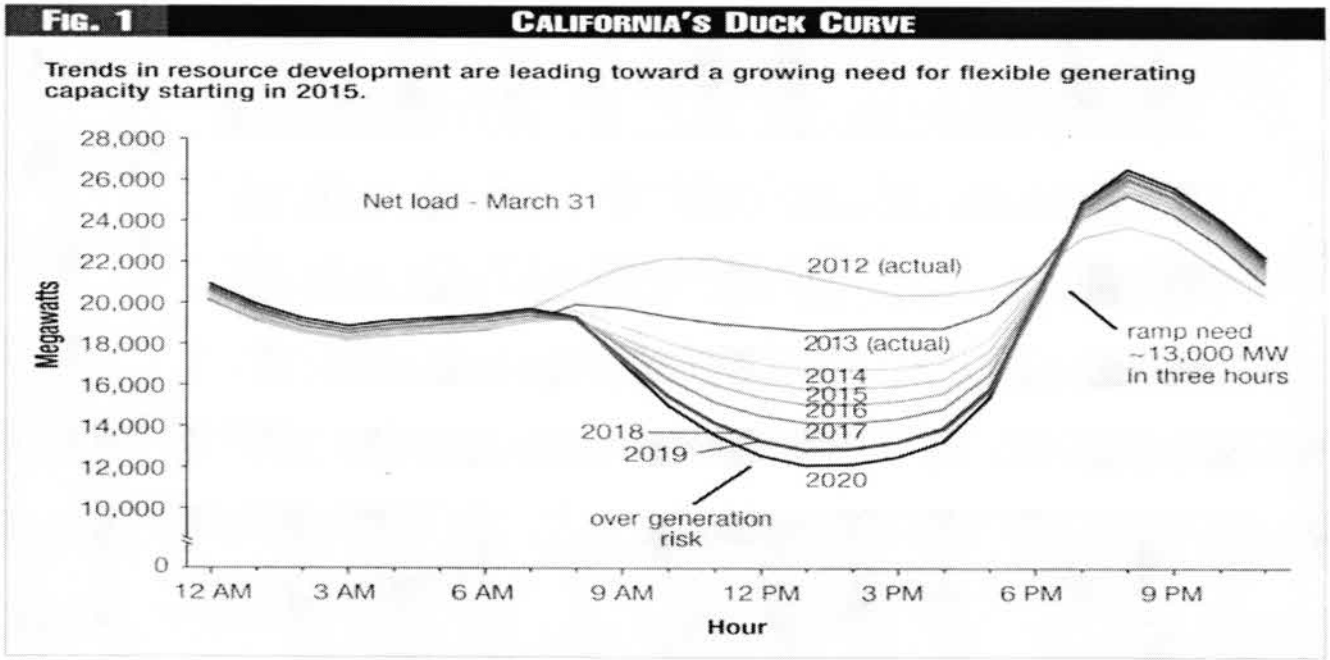
- Solar PV prices have fallen continuously and significantly, this has led to a dramatic increase in solar PV emplacement.





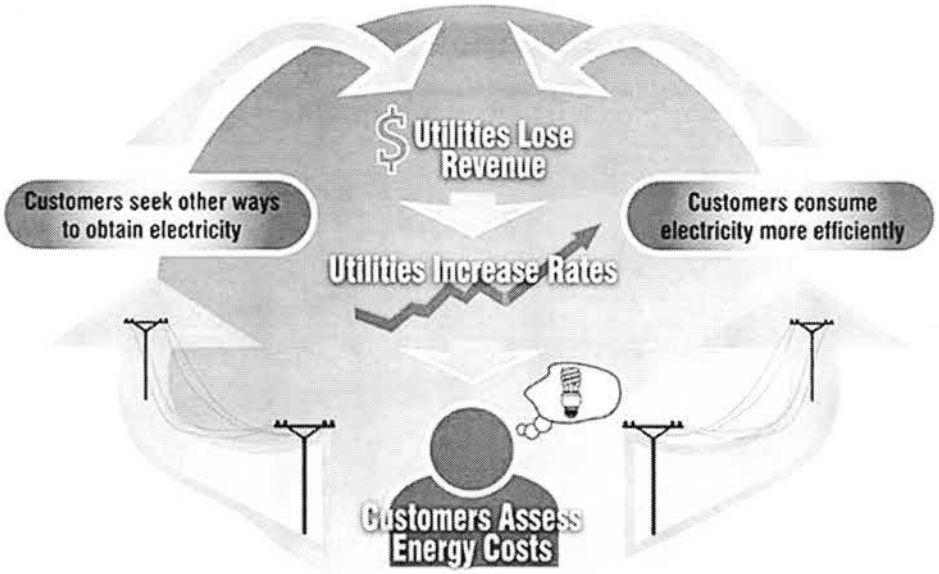
THE SOLAR CONUNDRUM

- As solar PV installations have increased, they have created systemic problems for the US electric industry.



THE SOLAR CONUNDRUM

- The "Duck Curve" creates physics challenges, but PV also creates financial challenges. Some, hyperbolically, call this the "utility death spiral."



THE SOLAR CONUNDRUM

- Yet, the solar PV installation industry also has challenges – the solar sellers vs. the solar leasers. Solar leases are popular with homeowners, but come with problems for homeowners.

	OWNING	LEASING
COST	ZERO UPFRONT COST SOLAR LOAN	ZERO UPFRONT COST 20 YEAR LEASE PROGRAM
MONTHLY PAYMENT	FIXED PAYMENTS FOR THE LIFE OF THE LOAN	MONTHLY PAYMENTS THAT INCREASE BY 3-5% ANNUALLY
OWNERSHIP	HOMEOWNER	LEASING COMPANY
FEDERAL TAX CREDIT	HOMEOWNER	LEASING COMPANY
CSI REBATE	HOMEOWNER	LEASING COMPANY
ABILITY TO SELL HOME	YES	BEWARE
PAYBACK PERIOD	4-7 YEARS	AT THE END OF THE LEASING TERMS YOU STILL DO NOT OWN THE SYSTEM. FEDERAL TAX CREDIT AND REBATES WILL BE EXPIRED
TOTAL SAVINGS	EXCELLENT	MINIMAL FOR HOMEOWNER VERY PROFITABLE FOR LEASING COMPANY
HOME VALUE INCREASE	YES! YOUR HOME VALUE WILL INCREASE $20 FOR EVERY $1 IN ANNUAL ELECTRICAL SAVINGS ACCORDING TO THE APPRAISAL INSTITUTE JOURNAL	NO! IF THE NEW HOMEOWNERS DO NOT QUALIFY FOR THE REMAINING TERM OF LEASE AND THE HOME SALE DOES NOT INCLUDE THE PREPAY FEES AND REMAINING LEASE THAN YOU CAN NOT SELL YOUR HOME!

THE SOLAR CONUNDRUM

- Thus, the solar conundrum includes the following challenges:

➢ Solar PV pricing has fallen, and led to dramatic and continuing consumer interest in installing solar PV on homes,

➢ Solar PV growth as a distributed generation resource is creating significant and costly physics challenges to the US electric grid,

➢ As the electric industry prices in the costs from solar PV, the costs of solar PV increase, and the subsidy from non-solar homes increases,

➢ Utilities lose revenue from solar homes, and recover thru lost fixed cost revenue mechanisms, further increasing costs on non-solar customers,

➢ Leasing and selling solar PV firms are also increasingly at odds.

SOLVING THE SOLAR CONUNDRUM

- Thus, to solve the Solar Conundrum, we must:

➢ Create a managed implementation of solar PV as a distributed generation resource – ensuring that it does not destabilize the grid,

➢ Ensure that solar PV integration is integrated with flexible generation to support solar PV's production fluctuations,

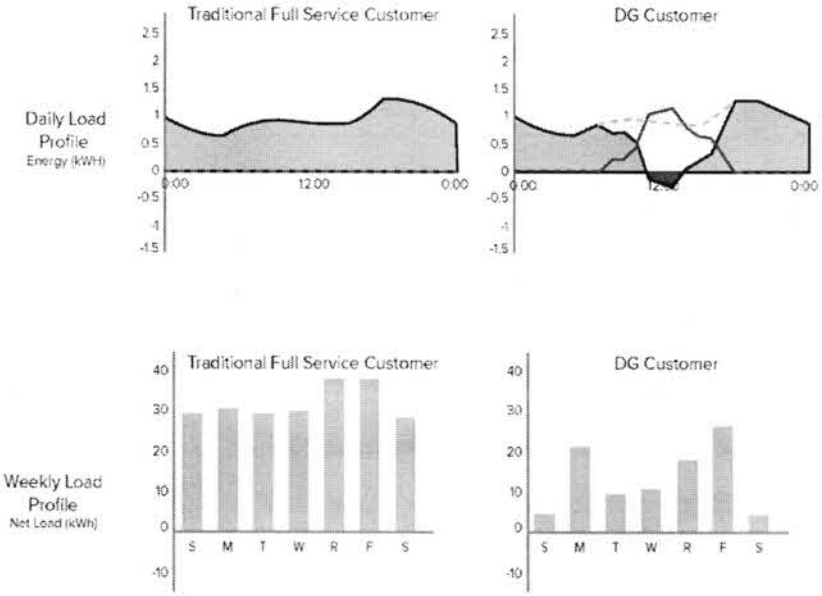
➢ Ensure that utilities remain financially strong and capable of overseeing the above two steps,

➢ Balance the fact that solar leasing and solar selling have very different economics,

➢ Create a pathway to ensure solar PV does not only go to the "haves" while stranding the "have nots" with the stranded costs and lost fixed costs of the grid.

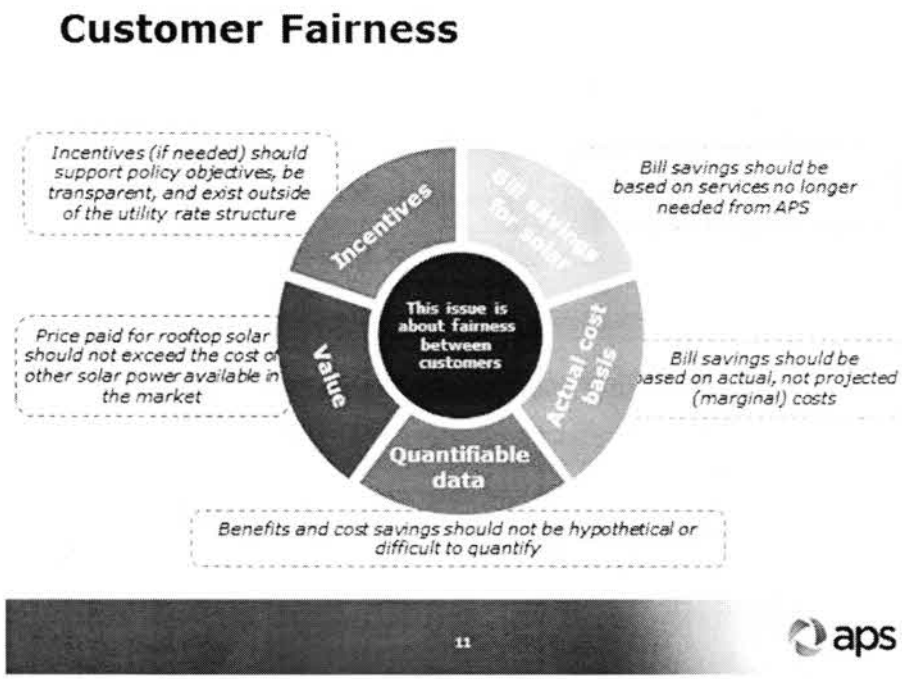
SOLVING THE SOLAR CONUNDRUM, PREVIOUS EFFORTS

- Net Metering attempts to find the "fair price" of the solar produced by a solar PV home but not consumed, and instead, placed onto the grid.
- It also attempts to find the "fair cost" that the solar PV home should pay to cover the costs of the grid, because the solar PV home still relies on the grid most of the time.

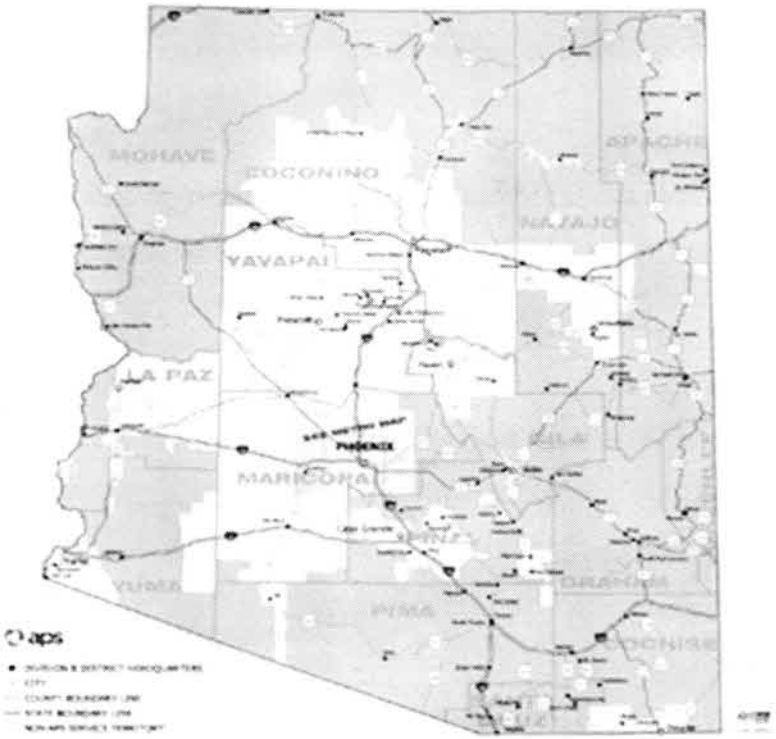


SOLVING THE SOLAR CONUNDRUM, PREVIOUS EFFORTS

- Finding the "fair price" and the "fair cost" is pursued through litigated processes at Public Utility Commissions (PUCs)
- The problem, as we see it, is that those "fair prices" and "fair costs" are sought out at the system average level.



SOLVING THE SOLAR CONUNDRUM

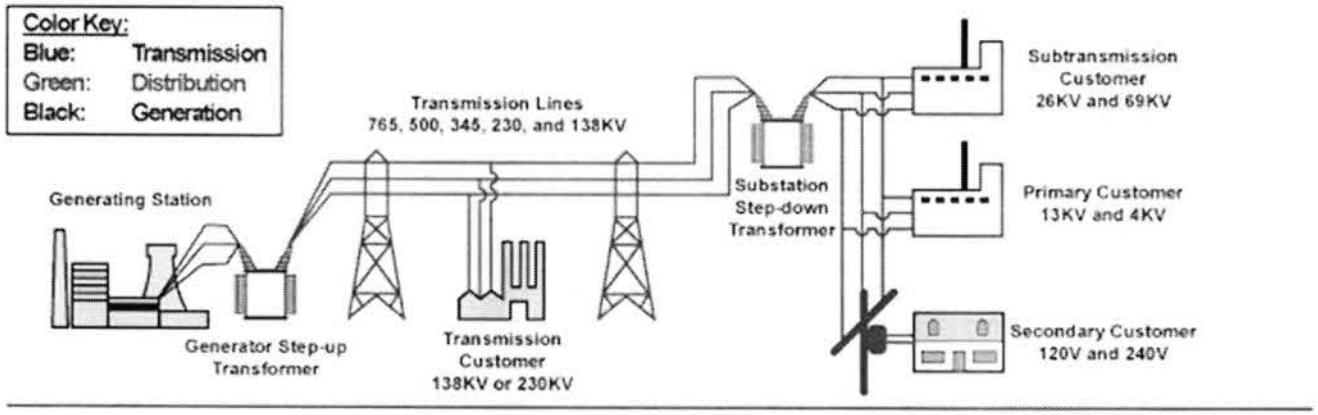


- To take just one utility, Arizona Public Service (which is engaged in the hottest political and policy fights on solar PV), the geographic size and diversity of its system are vast.

SOLVING THE SOLAR CONUNDRUM

- We believe that to begin solving the Solar Conundrum, we must identify the specific costs that solar PV emplacement will drive at the nodal level. To understand our approach, one must first understand the basic design of the electric grid.

Basic Structure of the Electricity Distribution System



Source: US-Canada Power System Outage Task Force

SOLVING THE SOLAR CONUNDRUM

- We believe that utilities should develop, using renewable energy subsidy funding, a map of their grid that shows the capacity for solar PV at the nodal level. Each distribution node, at the subdivision level for example, will have different capacity for solar PV installation.
- Furthermore, it is economically and physically certain that each node will see its capacity for solar PV installation become more constrained as more solar PV is installed in that node.
- Thus, the utility's model will show that each node becomes increasingly costly as solar PV installations cross thresholds.

SOLVING THE SOLAR CONUNDRUM

- Cost elements in the nodal approach:

More Localized ----- Less Localized

Generation	**Ability of utility's resources to provide ancillary services required by increased solar. This number will reflect load areas.**
Transmission	**Ability of utility to deliver ancillary services to each node, and to handle solar pv generation from each node.**
Distribution	**Ability of utility to handle solar pv in that neighborhood area. Distribution wires, transformers, meters, all vary in age and condition, thus have differing ability to emplace solar. And as solar penetration increases, the node's needs become more costly.**

SOLVING THE SOLAR CONUNDRUM

- Those capacity costs are real – and as those costs are driven by solar PV installation, they should be recovered from the cost-causer.
- Those costs should reflect the cost relationship between increasing solar PV installations in a node, and the utility's need to increase investment in that node to maintain its functionality in the face of increased solar PV installations.
- "Fully apportioned costs, then, should reflect cost relationships, not absolute costs."
  - Principles of Public Utility Rates, James C. Bonbright, Chapter XVIII, Section "FULLY DISTRIBUTED COSTS AS FIRST APPROXIMATIONS OF REASONABLE RATES"

SOLVING THE SOLAR CONUNDRUM

- The utility then, should provide its analysis of the capacity of each node to withstand varying levels of solar PV – and provide the estimated costs that will be assessed to solar PV within each level of uptake. A very simple, and wholly hypothetical example, demonstrates:

NODE	0 – 2 MW of Installed Solar PV	2.01 – 3.5 MW of Installed Solar PV	3.501 – 5 MW of Installed Solar PV
Township 6 North, Range 25 East (T.6N,R.25E)	$4.44/kW	$6.66/kW	$8.88/kW
T.18S,R11W	$7.77/kW	$13.13/kW	$31.45/kW
T.12S,R3E	$22.22/kW	$30.30/kW	$45.45/kW

SOLVING THE SOLAR CONUNDRUM

- Solar sellers and leasers would be able to identify those nodes that have lower kW capacity costs and can pursue development of those nodes – however, as each node's installed solar PV crosses thresholds, the costs of continuing to emplace in that node become high enough to make that node uneconomic.
- Sellers and leasers would then transition their sales activity to the next cheapest node.
- This ensures that solar PV capacity costs are recovered, they are recovered at the cost-causer level, and those costs are fair and transparent.

SOLVING THE SOLAR CONUNDRUM

- The capacity costs collected under this model can be assessed through an upfront installation fee, or a production fee on kWh – or a hybrid of the two approaches.
- The money collected under this model should be treated as utility revenue and the utility should be allowed to invest those revenues into the infrastructure required to support solar PV.

SOLVING THE SOLAR CONUNDRUM

- Next, we must address the fact that solar PV installations are going onto homes with the financial resources to emplace it (either cash for a purchase, or a high credit score for a lease.)
- The only solution to this, in our opinion, is what we call "Blue Collar Solar".
- Blue Collar Solar is the notion that a utility customer should not be precluded from solar PV for lack of resources – the only resources they should need are a telephone and a rooftop.
- They should be able to call their utility and provide their rooftop to the utility for utility-owned and maintained solar PV.

SOLVING THE SOLAR CONUNDRUM – BLUE COLLAR SOLAR

- Blue Collar Solar programs are underway in Arizona's two largest utilities: Arizona Public Service and Tucson Electric Power have "pilot programs" that allow those utilities to emplace, maintain, and own solar PV on residential customers' rooftops.
- Those programs should be expanded to ensure that solar PV is equitable – to date, solar PV has been fueled by reverse Robin Hood economics. All customers are forced to pay subsidies for solar PV – but only those with strong financial resources (cash or a high credit score) take the benefits.

SOLVING THE SOLAR CONUNDRUM

- By expanding Blue Collar Solar,)i.e., utility-owned solar PV on rooftops),
- By establishing a capacity cost at the nodal level, and by allowing the utility to emplace recovered capacity costs into infrastructure to serve the increasingly "solarized" grid,
- By providing all solar sellers and leasers with an upfront capacity cost at the nodal level and at various installed capacity levels,
- PUCs will be able to ensure that the solar industry continues to grow but does so in a manner that does not destabilize the grid, and
- PUCs will be able to ensure that utilities are able to recover the costs and recover a return on those costs of improving the grid's ability to "solarize", and
- PUCs will be able to ensure that solar is not only available to the "haves" – instead, all customers with rooftops will have options.

RELATED ISSUE – RATE DESIGN

- Rate Design
  - The traditional approach to rate design is to use fixed monthly charges (set to recover metering, billing, and administrative costs) and consumption charges (set to recover generation, transmission, and distribution charges.
  - That approach is too simplistic to address the impact of large-scale solar adoption. As solar rooftops appear, the solar customers consumption declines, yet they still rely on the grid. The entire issue of solar fees related to net metering is driven by this phenomenon.
  - PUCs will either have to increase the fixed component, or adopt a three-rate approach to include demand charges.

RELATED ISSUE – LFCRS

- Lost Fixed Cost Recovery
  - Developing cost at the distribution node level will generate revenue to address solar's impact on the infrastructure of the grid,
  - It does not however address the impact of solar on utility revenue collection,
  - LFCRs continue to be used in many states to provide the utility with recovery of the lost revenues created by solar adoption,
  - However, the LFCR simply pushes solar's costs back onto non-solar customers once again – just as the RE subsidies have done,
  - A new approach to rate design is required to address solar's impact on existing generation asset recovery.

Exhibit 2

Residential Sector Key Indicators and Consumption

http://www.eia.gov/outlooks/aeo/data/browser/#/?id=4-AEO2017&cases=ref2017&sourcekey=0

Wed Jan 11 2017 12:18:36 GMT-0700 (US Mountain Standard Time)

Source: U.S. Energy Information Administration

	full name	units	2015	2016	2017	2050	Growth (2016-2050)
Key Indicators							
Households (millions)							
Single-Family	Residential: Single-Family	millions	80.54888	81.10302	81.82338	107.9285	**0.80%**
Multifamily	Residential: Multifamily	millions	28.87088	29.11009	29.38024	41.52084	**1.00%**
Mobile Homes	Residential: Mobile Homes	millions	5.965145	5.842867	5.742257	4.56343	**-0.70%**
Total	Residential: Total	millions	115.3849	116.056	116.9459	154.0128	**0.80%**
Average House Square Footage	Residential: Average House Square Footage	sq ft	1695.088	1703.265	1711.678	1933.158	**0.40%**
Energy Intensity (million Btu per household)							
Delivered Energy Consumption	Residential: Household Energy Intensity: Delivered Energy Use	MMBtu/household	95.09217	91.51431	93.23595	70.15138	**-0.80%**
Total Energy Consumption	Residential: Household Energy Intensity: Total Energy Use	MMBtu/household	178.0302	172.3932	173.3631	127.4321	**-0.90%**
(thousand Btu per square foot)							
Delivered Energy Consumption	Residential: Energy Intensity per Square Foot: Delivered Energy Use	thousand Btu/sq ft	56.09867	53.72875	54.47049	36.28848	**-1.10%**
Total Energy Consumption	Residential: Energy Intensity per Square Foot: Total Energy Use	thousand Btu/sq ft	105.0271	101.2134	101.2825	65.91911	**-1.30%**
Delivered Energy Consumption by Fuel							
Solar Hot Water Heating	Residential: Nonmarketed Renewables: Solar Hot Water Heating	quads	0.009234	0.010317	0.011427	0.026228	**2.80%**
Solar Photovoltaic	Residential: Nonmarketed Renewables: Solar Photovoltaic	quads	0.076436	0.10585	0.136138	2.502433	**9.70%**
Wind	Residential: Nonmarketed Renewables: Wind	quads	0.019677	0.031693	0.031693	0.04404	**1.00%**
Total	Residential: Nonmarketed Renewables: Total	quads	0.116047	0.159662	0.191933	2.602231	**8.60%**
Heating Degree Days							
Mountain	Residential: Heating Degree Days: Mountain	HDD	4602	4670	4743	4522	**-0.10%**
United States	Residential: Heating Degree Days: United States	HDD	4083.6	3988.97	4140.888	3803.554	**-0.10%**
Cooling Degree Days							
Mountain	Residential: Cooling Degree Days: Mountain	CDD	1480	1477	1523	1845	**0.70%**
United States	Residential: Cooling Degree Days: United States	CDD	1489.038	1528.477	1403.335	1774.346	**0.40%**

Exhibit 3

THE CHALLENGE OF CONSERVATION:

JEVONS PARADOX, THE SAMARITAN PROBLEM, & UTILITY ECONOMICS

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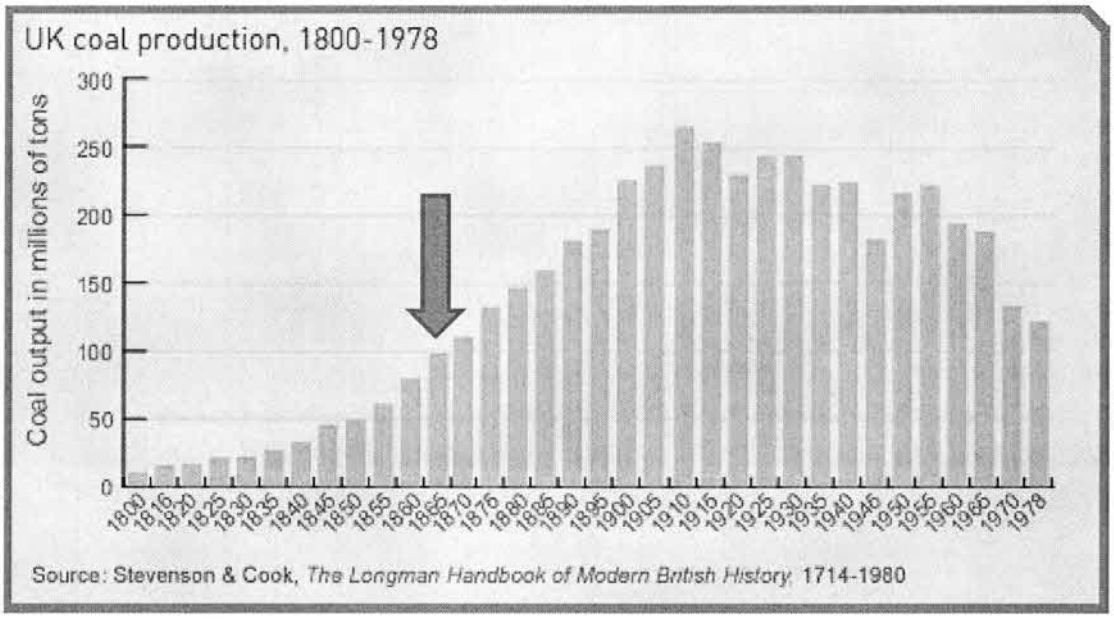
JEVONS' PARADOX



- In 1865 Stanley Jevons warned that increases in the efficiency of coal-fired steam engines (James Watts' work) would <u>not decrease</u> coal use – but would instead make coal use more efficient and lead to MORE coal consumption and production.

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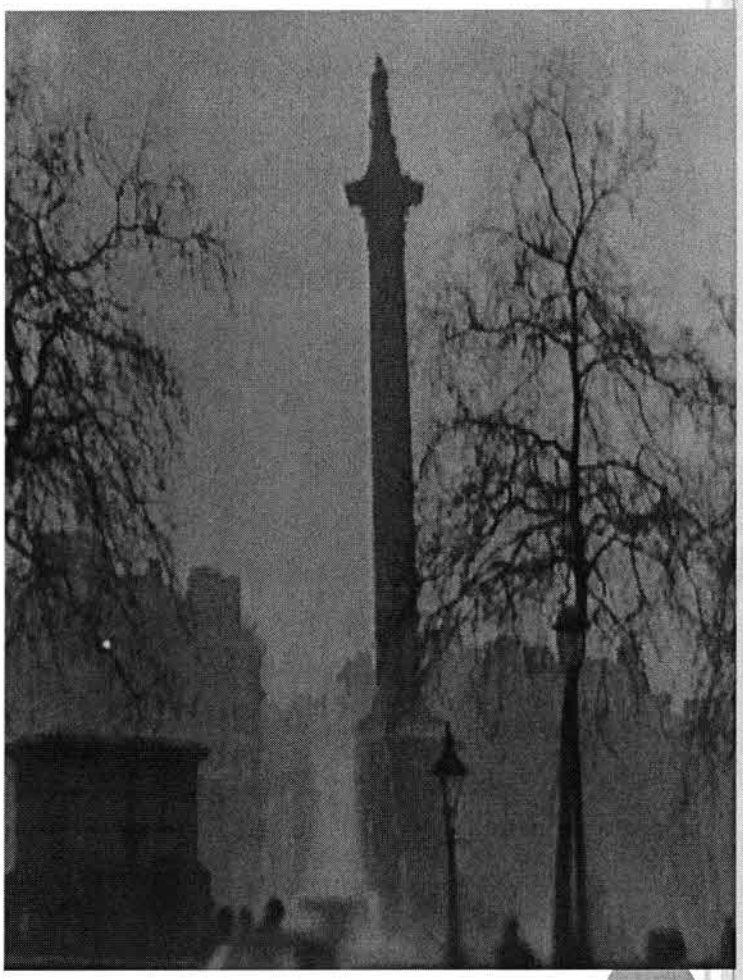
JEVONS' PARADOX

- After Jevons' prediction, nothing changed. .. Until The Great Smog of 1952
  - Over 4,000 Londoners dead in five days…
- Estimates of more than 10,000 premature deaths **annually**, for over 100 years in UK from coal smog.
  - I.e., one million people dead before their time.



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JEVONS' PARADOX

- Increases in efficiency do not lead to reductions in usage of a resource – increases in efficiency lead to more usage.
  - *Beliefs and allegations that increased efficiency will reduce total consumption, or reduce the price of a resource, ignore Jevons' Paradox and history: Q.v., gasoline, electricity, water.*

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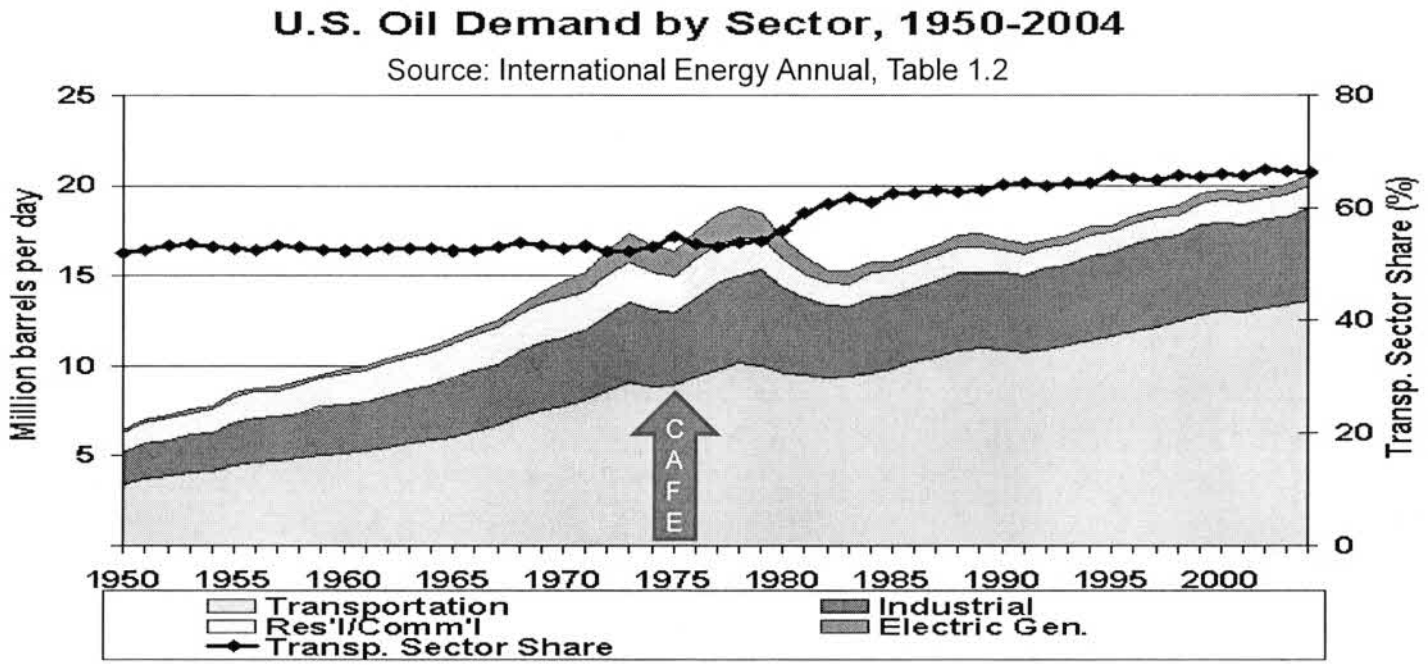
JEVONS' PARADOX

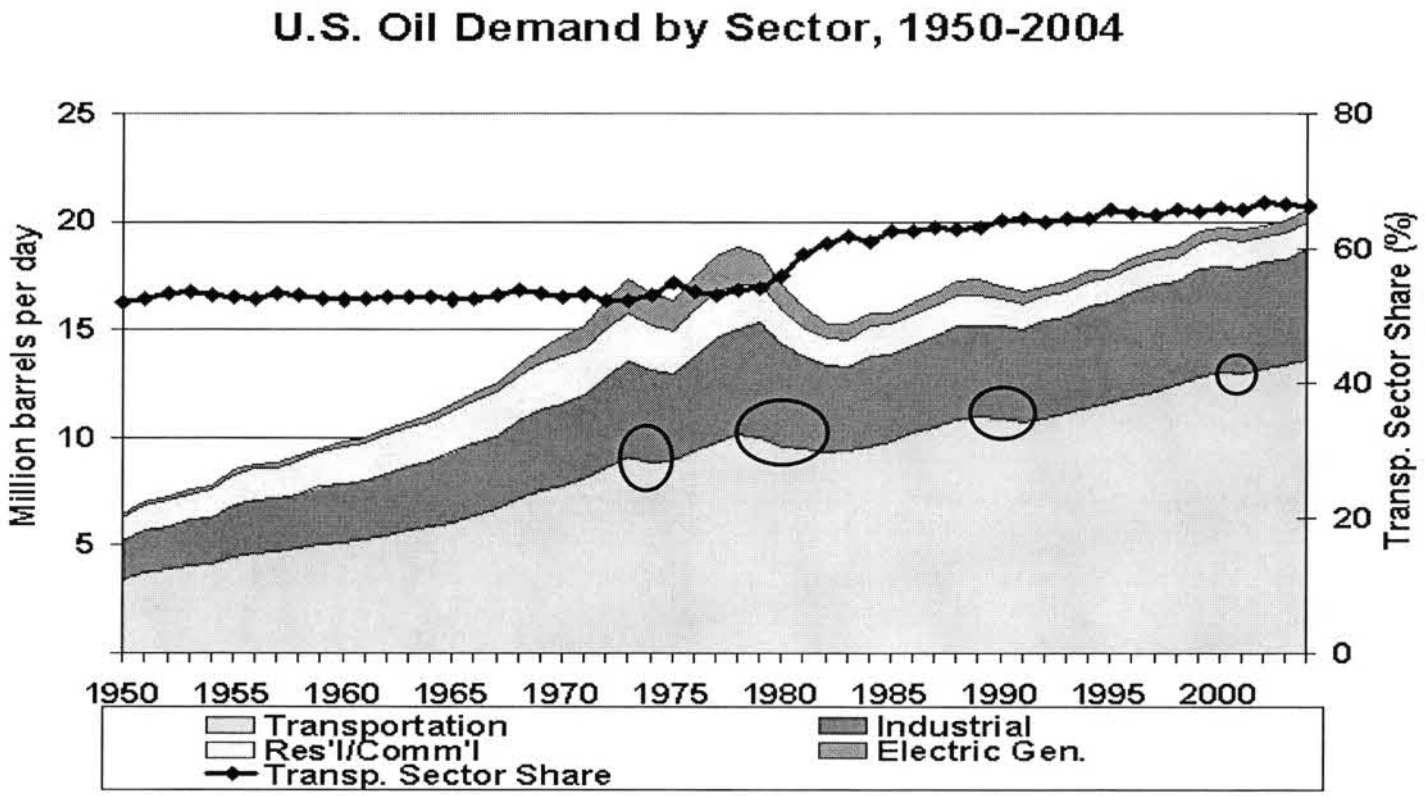
- Supply must increase **faster** than demand if prices are to fall – *but* resource efficiency **increases** demand.
  - *With increased efficiency of a resource, more uses are found for that resource; and previously uneconomic uses become economic – and demand therefore increases.*

JEVONS' PARADOX AND THE DEMAND SIDE: GASOLINE

- Oil Shocks of 1973-4 led to 1975's U.S. Corporate Average Fuel Economy (CAFE) standards.
  - Intent of CAFE Standards was to reduce U.S. gasoline consumption (shown in blue).



RECESSIONS WERE THE ONLY PERIODS WHEN GASOLINE CONSUMPTION DECLINED



JEVONS' PARADOX & WATER IN ARIZONA

- Arizona's 1980 Groundwater Management Act recognized that aquifers were being overdrawn in five areas
  - Creation of "Active Management Areas"
  - Led to creation of Groundwater Replenishment Districts, and
  - Assured Water Supply (Certificates & Designations)

- Central Arizona Project deliveries **and** the Act **reduced groundwater consumption** – but not total water consumption.

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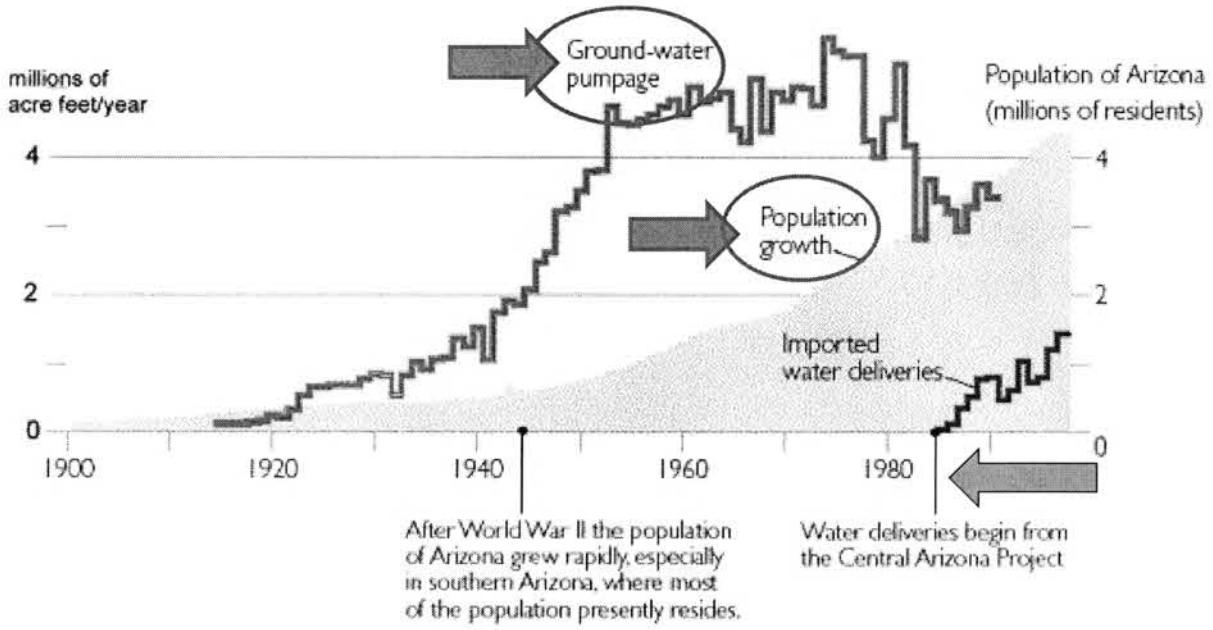
Population and water use in Arizona



USGS circ. 1182

Key Issues with Population & Water in Arizona

- The Groundwater Management Act did not take away agricultural rights to groundwater,
  - CAP Water Deliveries offset Agricultural and Municipal & Industrial use of Groundwater.
  - It limited groundwater rights as land was sold and developed and led to aquifer recharge through Assured Water Supply rules, but a sale/development must occur to reduce the rights.

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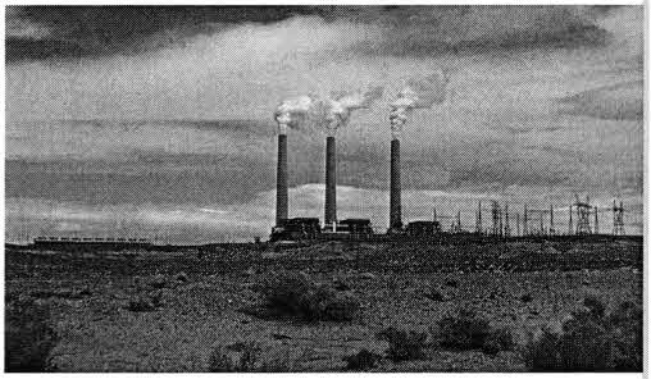
GROUNDWATER'S BIGGEST CONCERN

- EPA rules on Nox emissions at Navajo Generating Station.



  - Navajo Gen Station produces over 2,200 MW of power to pump CAP water the 334 miles to Phoenix and Tucson.
  - In 2009, Insight predicted strict NOx controls would lead to a greater than 200% increase in CAP water costs, CAP is now predicting a greater than 400% increase under the strictest EPA measures.

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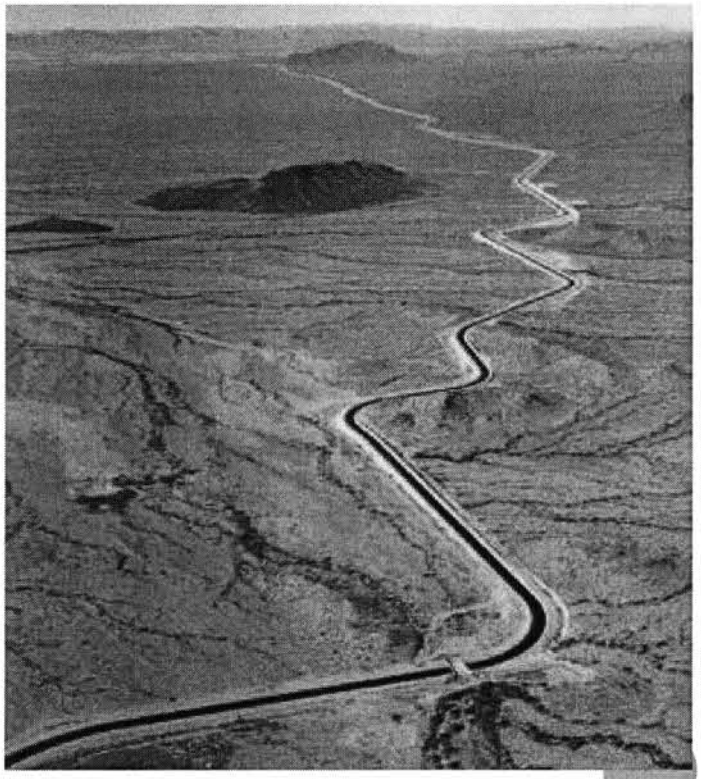
THE CAP DRIVES GROUNDWATER SAVINGS

- Arizona farmers and cities do not have the ability to pay 200% to 400% more for CAP water
  - **They will pump the groundwater they own rather than buy CAP water.**
- The costs of groundwater recharge will soar with CAP prices – and as aquifer use increase the need for recharge.



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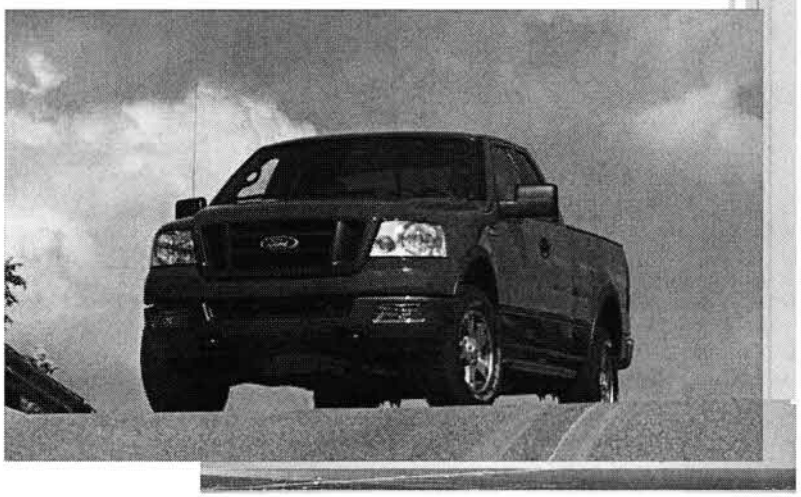
Rational Self Interest Theory

- *Let individuals evaluate the economic benefits of conservation and individuals will choose to conserve resources…* Or will they?

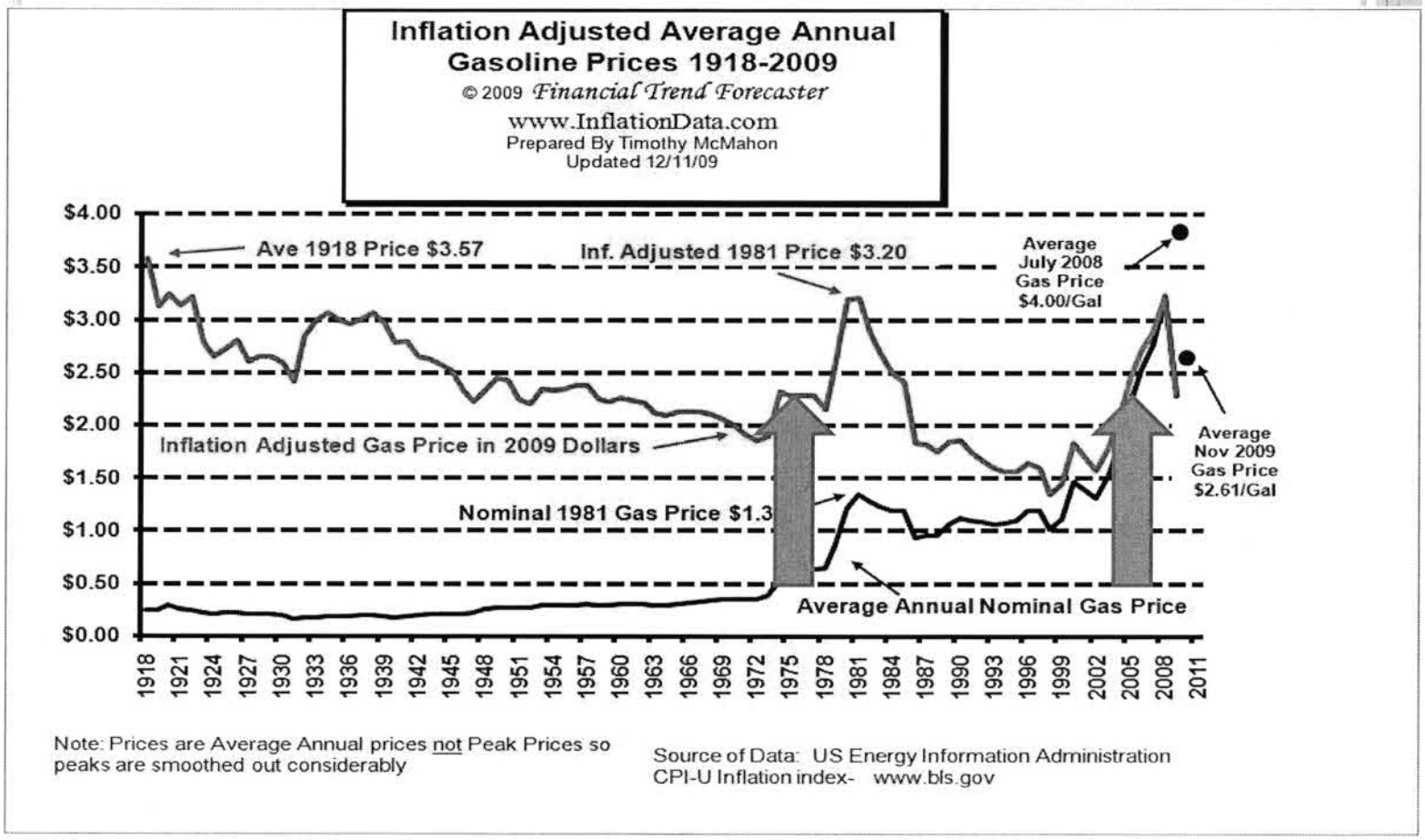
Rational Self Interest on The Demand Side: CAFE Standards and Vehicle Purchases

- 1976 Top selling vehicle in the U.S.
  - **17.8 mpg average**

- 2006 Top selling vehicle in the U.S.
  - **14.0 mpg average**



WE PICKED 1976 AND 2006 BECAUSE THE INFLATION-ADJUSTED COST OF GAS WAS EQUIVALENT – GAS WASN'T CHEAPER, BUT CARS GOT BIGGER.



Rational Self Interest on The Demand Side: Conservation in Electricity?

By 1980, 31 states had EE standards – by 2010, 46 states. EE makes appliances, HVAC, lighting, and homes more efficient. The Result of 30 year's of EE?

- U.S. electricity use soared as homes got bigger, appliances became more prevalent, and all that efficiency led to **higher costs & consumption**.

- But, quality of life also increased – consumption is not a bad thing in and of itself. The point is that, again, increased efficiency led to more use of the commodity.

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30 Years' Worth of Conservation in Electricity? Houses bigger, costs higher, usage up.

1980 Numbers	2010 Numbers
Median U.S. Home: **1,595 square feet**	Median U.S. Home: **2,169 square feet**
Electric price/kWh: **5.36 cents**	Electric price/kWh: **11.54 cents**
U.S. electric use ~ **33/Mbtu per capita**	U.S. electric use ~ **50/Mbtu per capita**

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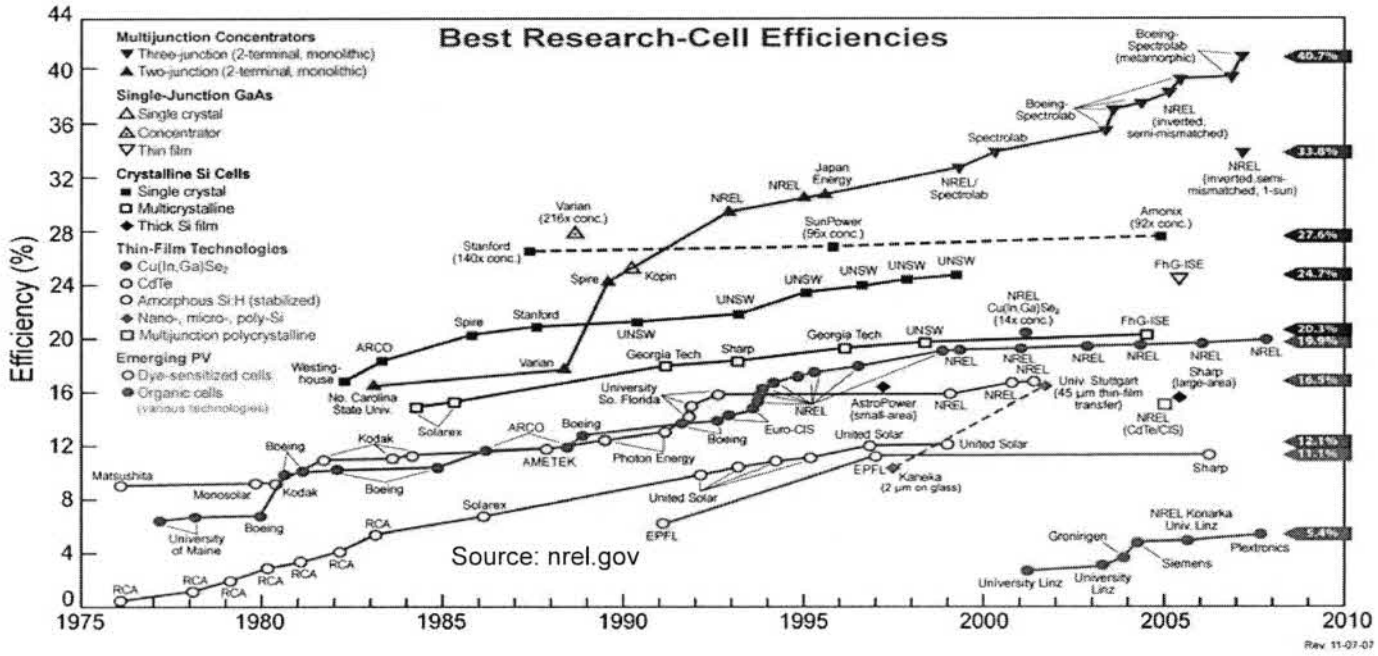
RATIONAL SELF INTEREST AND THE SUPPLY SIDE: SOLAR PV



Slight increases in efficiency for 35 years – yet recently is installed capacity booming… Why now?

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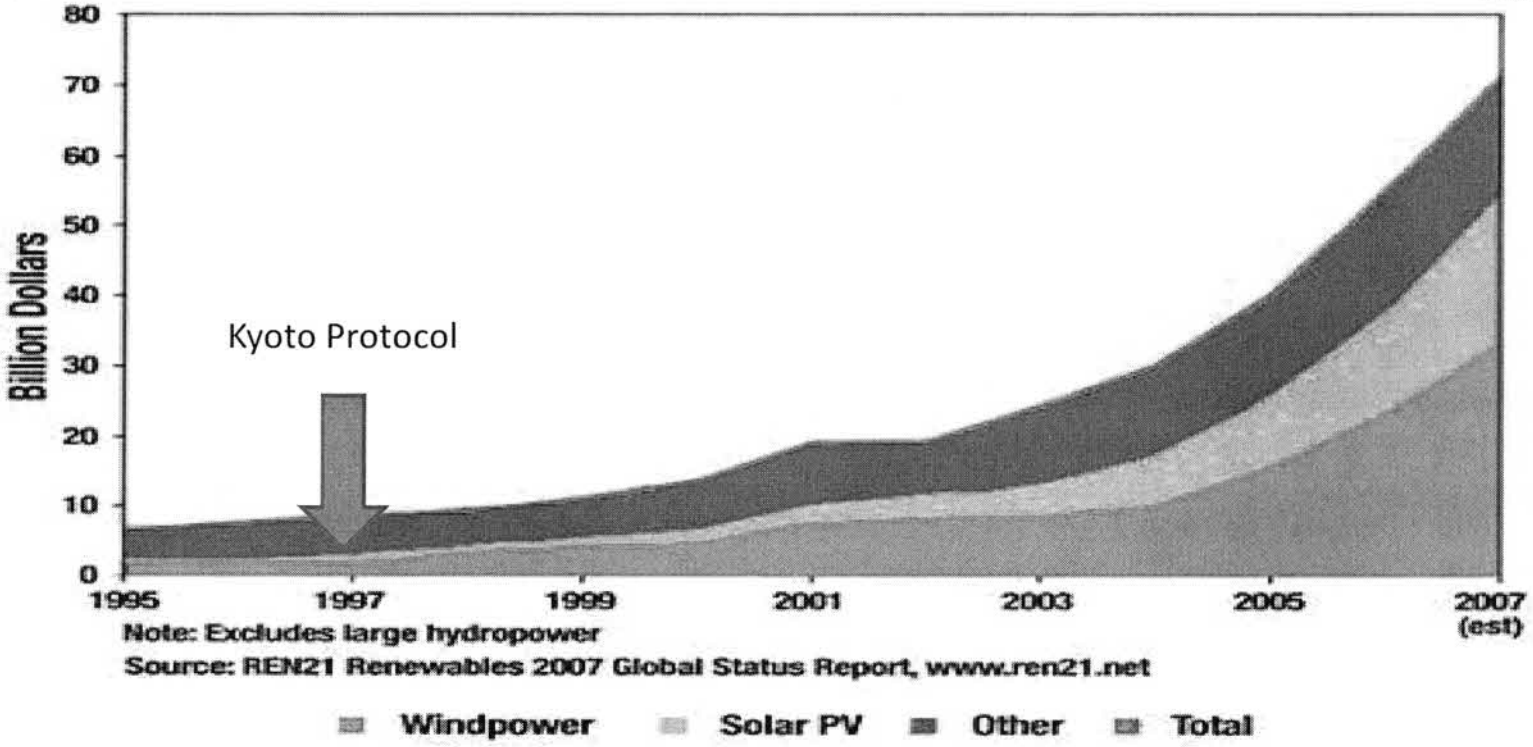
1997 Kyoto Protocol and the Increase in Renewable Energy including Solar PV



Utility-scale economic incentives led to massive increases in renewable energy construction.

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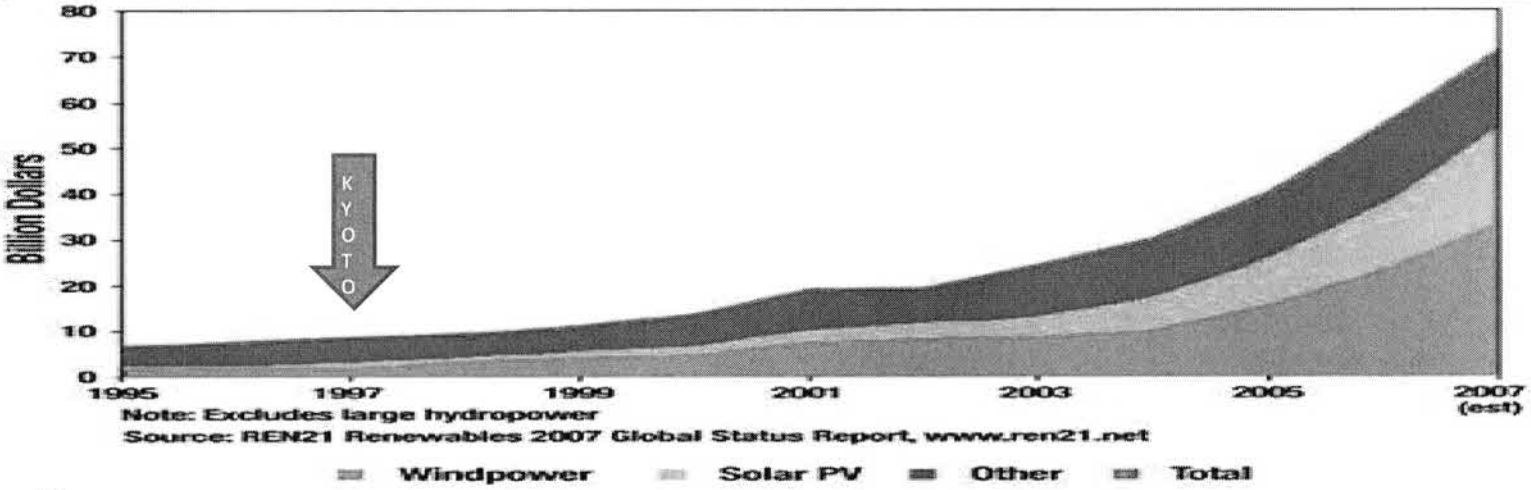
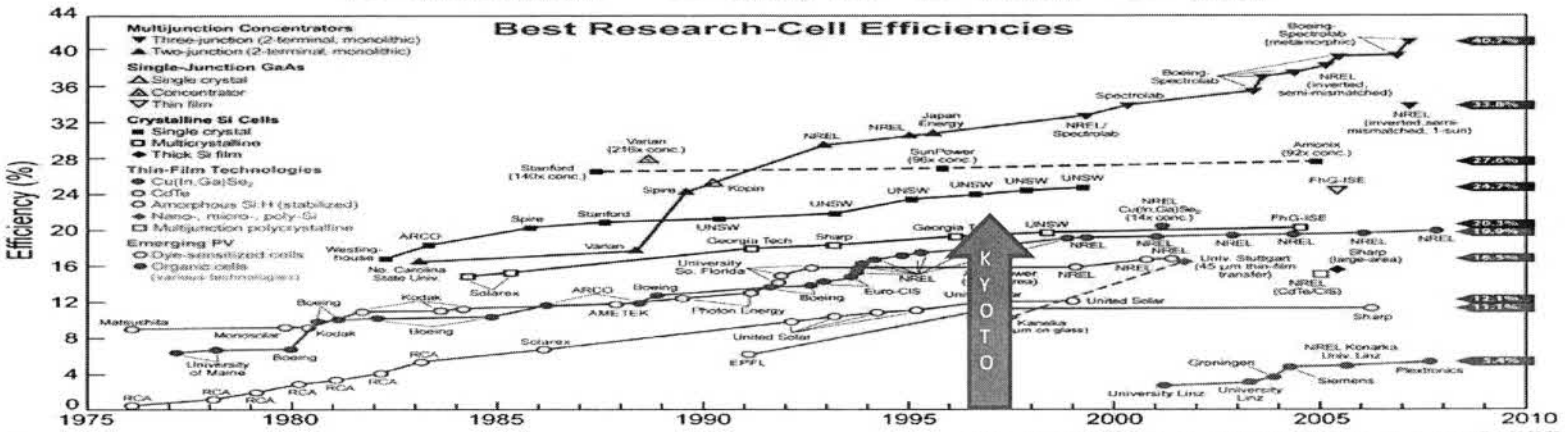
EFFICIENCY DIDN'T INCREASE AFTER THE KYOTO PROTOCOL, GOVERNMENT MANDATES DID.

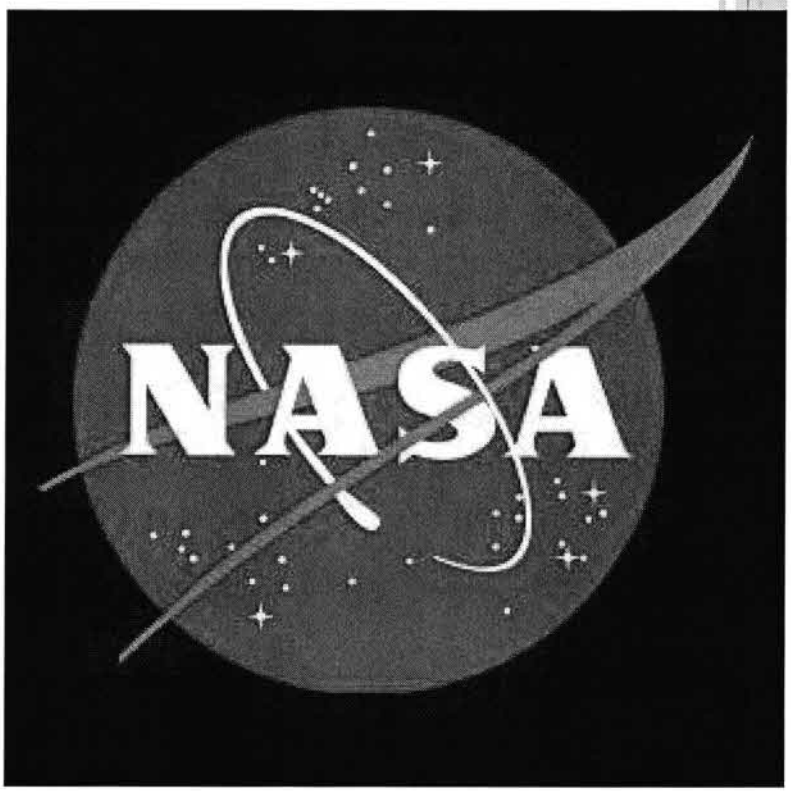




Rational Self Interest & The Samaritan Problem:

People say they do things that they don't actually do.

- 2009 National Taxpayer Advocate report to Congress: $17 billion in **overstated** charitable contributions.
  - For Context, in 2009, NASA's total budget was $17.6 billion



THE SAMARITAN PROBLEM

- Water – Use It Wisely ("WUIW") Poll Numbers
  - 84% of respondents recall WUIW in a 2007 Study by BBC Research
    - For Context: 81% of Americans support allowing medical marijuana
      - (ABC News/Washington Post, Jan 12-15 2010)

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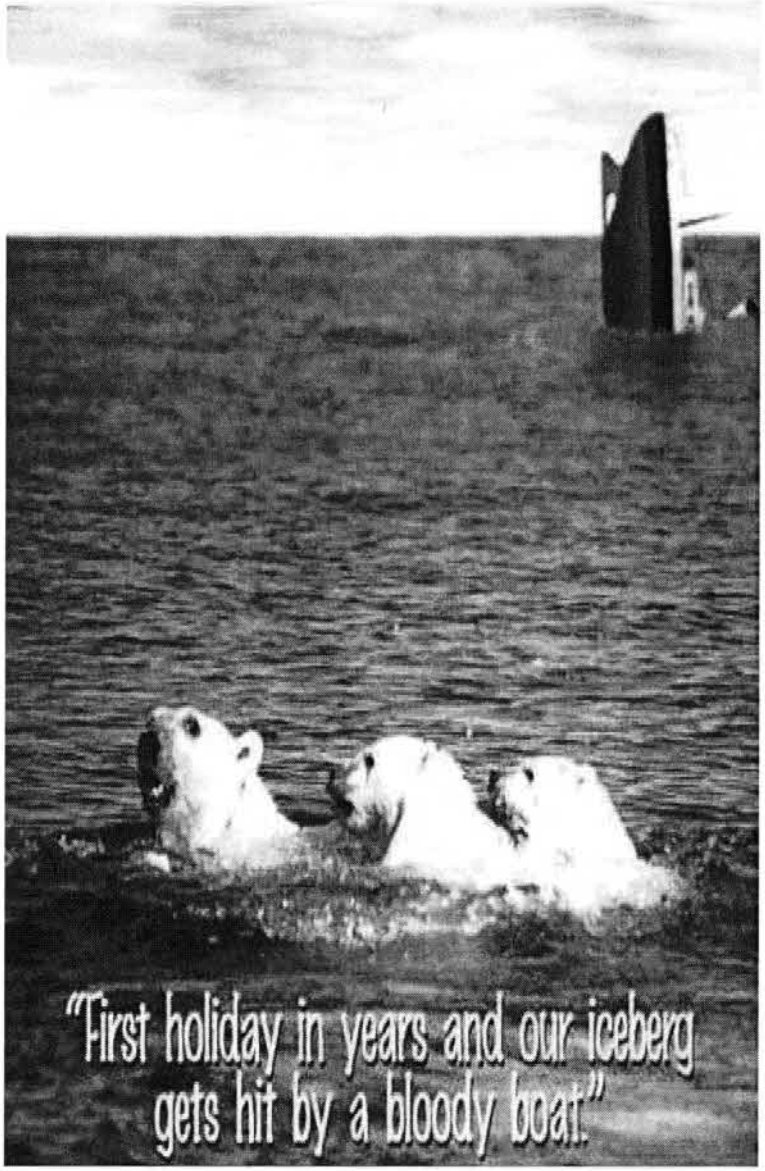
SAMARITANS & WUIW

- 63% of those polled knew WUIW was a water conservation program
  - And those respondents scored higher on questions about water conservation
    - For Context for 63% in a poll: 65% approval rating for President Obama on his inauguration
      - (Rasmussen)
    - Another Context: 65% think "unanswered questions" surround JFK assassination
      - (ABC News)

SAMARITANS & WUIW

- 44% of respondents said they had 'taken steps' to change their water use **because of** "Water – Use It Wisely"
  - For Context: 41% say global warming "not a serious problem"
    - (Rasmussen, Dec 2009)



SAMARITANS & WUIW

- **91%** of respondents who said they acted as a result of WUIW said they had decreased their usage as a result of WUIW
  - For Context for 91% in a poll: **94%** believe that men landed on the moon
    - (Gallup Poll, 1999)

JEVONS' AND SAMARITAN PARADOXES & WUIW

- Water Use It Wisely's poll numbers are incredible as each of the context points demonstrates.
- 91% of respondents said they reduced water use because of WUIW.
- As a marketing program it is a tremendous success, but **does it save water**?

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JEVONS & SAMARITAN PARADOXES & WUIW

- To measure the impact of "Water – Use It Wisely"
  - Full regression analysis was conducted on the 1,400-household survey,
  - The analysis quantified the actual water usage rates between consumers who were "aware/unaware," "knowledgeable/not informed," and "acted to conserve/haven't acted".
- **The results?**

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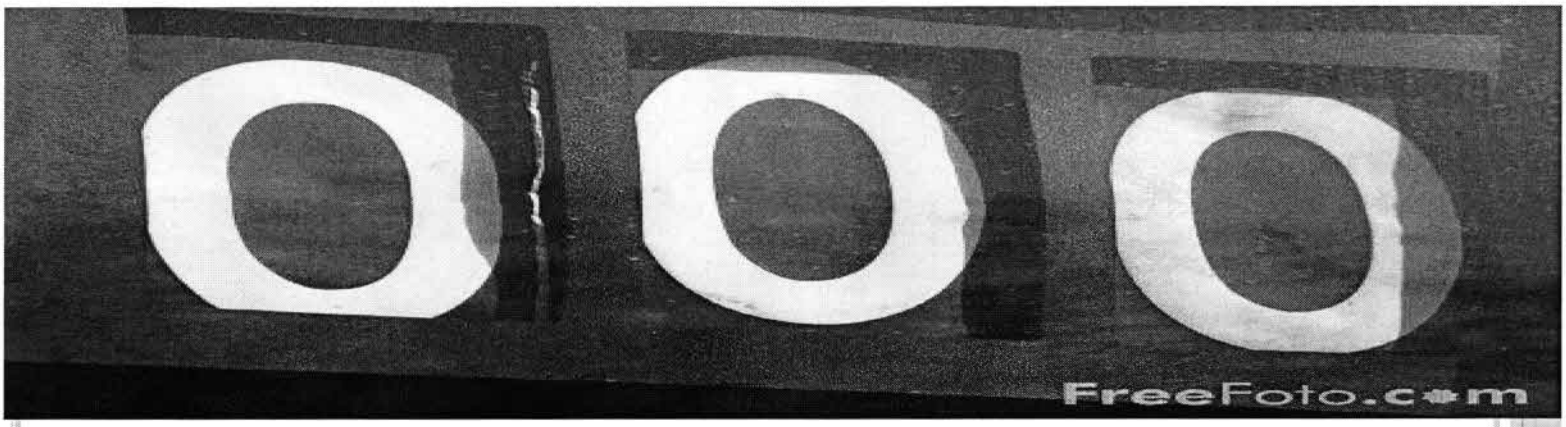

- "[D]id not produce any substantial or statistically significant differences",
- "Indistinguishable" differences between aware and unaware households; and between active and not-active conservation households,
- **There was NO difference in water consumption – people say they conserve based on messaging - but they don't.**

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Addressing the Jevons & Samaritan Paradoxes with Utility Economics

- Utility Economics is based on:
  - Economies of Scope and Scale which allow cost sharing,
  - Responsibility Assigned to One Entity (the utility),
  - Economic Incentives to Responsible Entity that lead to results.

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Utility Economics Principles

- Utility Returns can be improved or worsened if Utility fails to meet Regulatory Standards,
- Ratepayers receive reliable and adequate service – and must pay for their own use,
- Resources are conserved by unifying the responsibility of their stewardship and economically incenting judicious use.

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Utility Economics and The Environment

By creating economic incentives for rational utilization, we assure more rational usage.

We avoid cutting down the last Toromiro tree (q.v., Easter Island…)

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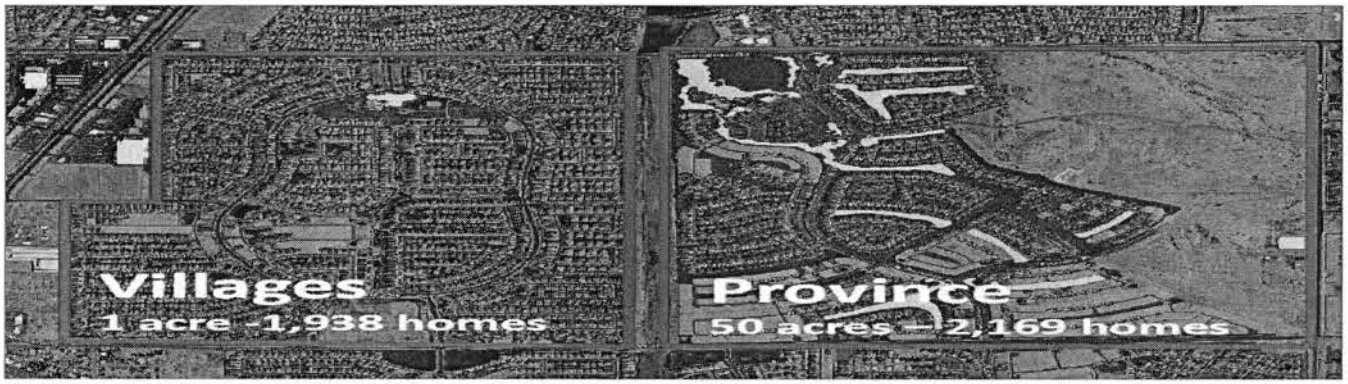
Water In Arizona – Our Toromiro Tree

- Guess which group of neighbors below pays an **extra** $60 per household, per year; to subsidize the other's water use?



Lake Areas

- The 1,938 homes in Villages pay $60 more a year so the homes in Province can have 52 acres of lakes and 130 acres of turf in an age-restricted, gated community.

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MAKING WATER SUSTAINABLE

- Utilities must be made whole for_planning, building, and maintaining sustainable infrastructure.

- Consolidated companies would simplify regulatory oversight and achieve economies of scale and scope.

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MAKING WATER SUSTAINABLE

- Send Price Signals to Consumers or they won't conserve resources. Utilities and regulators must cooperatively design utility-side demand management and conservation that will:
  - Engage and empower customers,
  - Send price signals on excess use and price rewards for judicious use,
  - Provide utility and consumers with timely, actionable information - smart meters, asset management plans, and feedback to the utility, the customer, and the ACC.

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MAKING WATER SUSTAINABLE

- Support infrastructure improvements on an as-needed basis:
  - Marry DSICs with asset management plans and conservation and efficiency measurements.

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MAKING WATER SUSTAINABLE

And most importantly: Ensure that water providers are financially viable.

- "The cost of something is what you give up to get it."
  - Greg Mankiw, Harvard economics professor
- "There is no such thing as a free lunch."
  - Fundamental Rule of Economics

- There is no way to have quality, reliable, sustainable infrastructure & water without ensuring companies are profitable.

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The Bottom Line of Conservation

- What has value must be managed,
- What gets managed is what gets rewarded – if consumption is rewarded (bigger car, more appliances, bigger home, larger lawn, lower bills) then consumption will increase,
- For water to begin a path toward sustainability, water must be valued and consumption rationalized.

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