Benefits of Utility Energy Efficiency

Tucson Electric Power
IRP Stakeholder Workshop
Ellen Zuckerman & Caryn Potter

SWEEP

Southwest Energy Efficiency Project (SWEEP)

- Non-profit public interest organization, founded 2001
- Advances policies and programs to stimulate greater energy efficiency in six western U.S. states
- Advances energy efficiency in the buildings, transportation, industrial and utility sectors

SWEEP

www.swenergy.org

Agenda

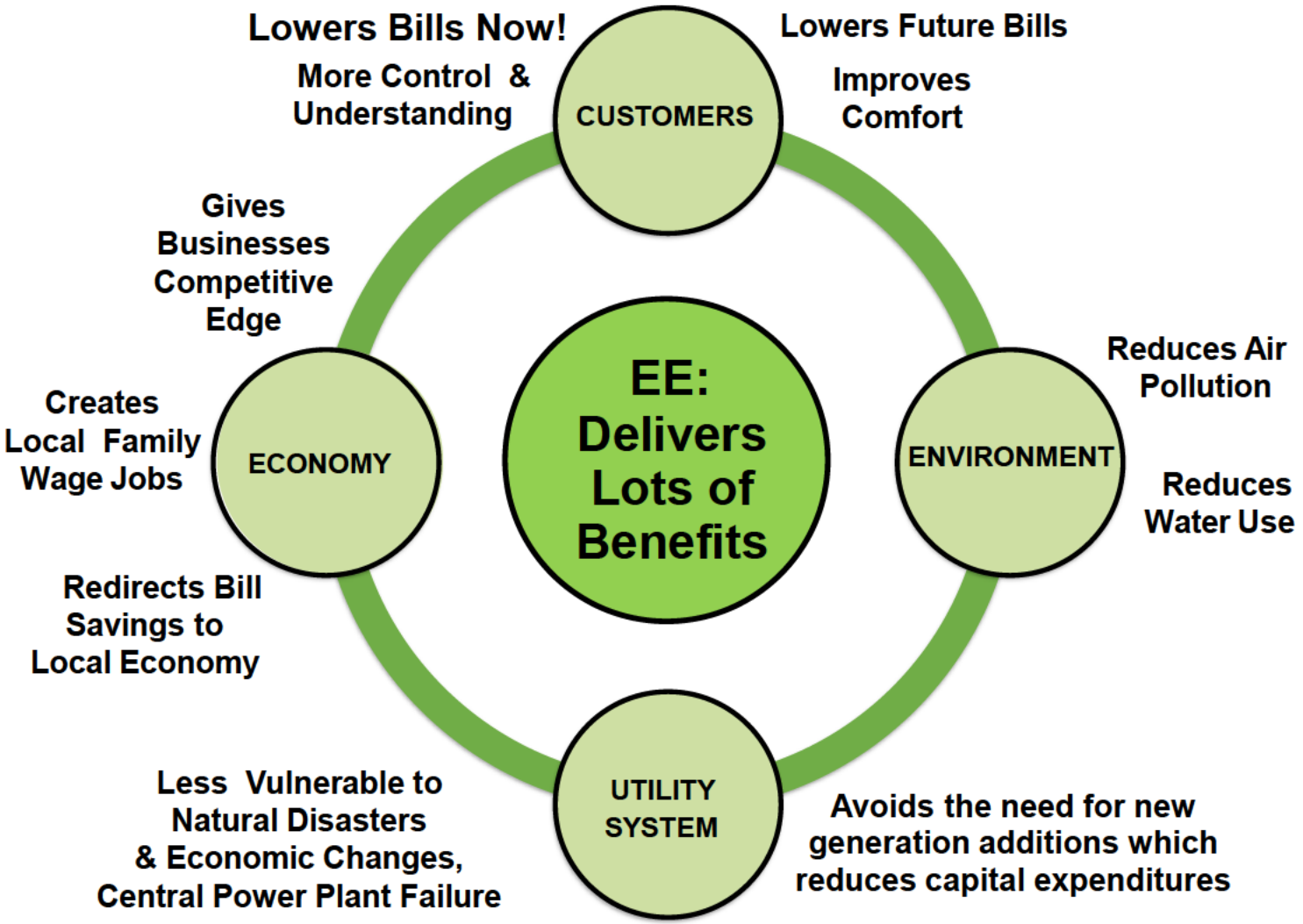
1) Energy Efficiency 101

2) Energy Efficiency in Utility Resource Planning

3) Transportation Electrification

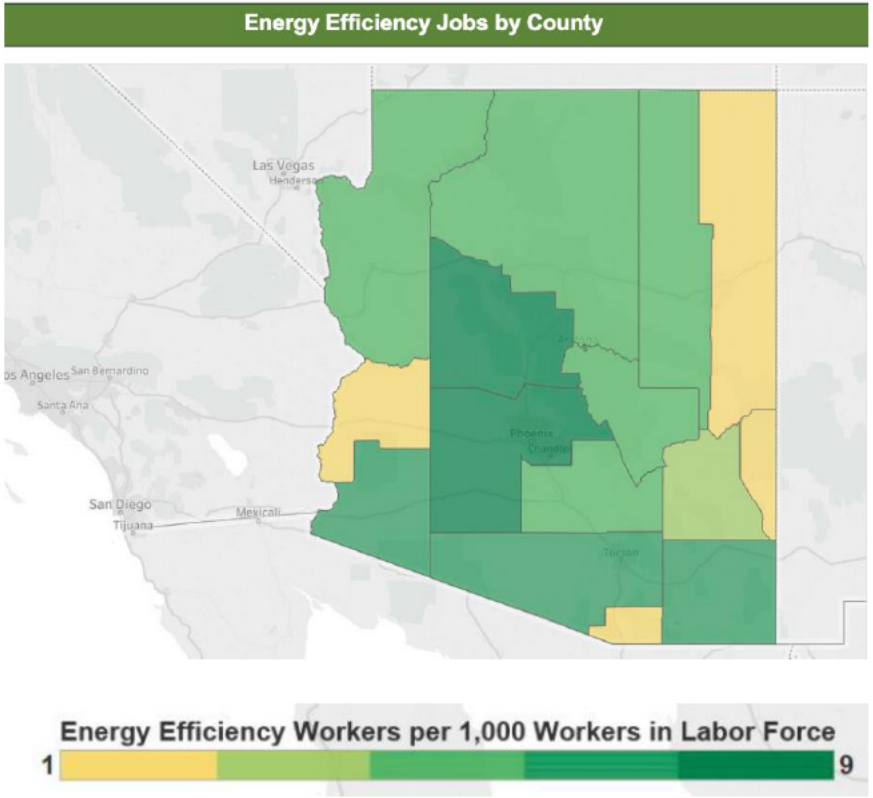
4) Independent IRP Analysis Conducted by SWEEP/Strategen

1) Energy Efficiency 101


Lowers Bills Now!
More Control & Understanding
CUSTOMERS
Lowers Future Bills
Improves Comfort
Gives Businesses Competitive Edge
ECONOMY
Creates Local Family Wage Jobs
Redirects Bill Savings to Local Economy
EE: Delivers Lots of Benefits
ENVIRONMENT
Reduces Air Pollution
Reduces Water Use
UTILITY SYSTEM
Less Vulnerable to Natural Disasters & Economic Changes, Central Power Plant Failure
Avoids the need for new generation additions which reduces capital expenditures

EE is Cost-Effective & Good for Arizona's Economy

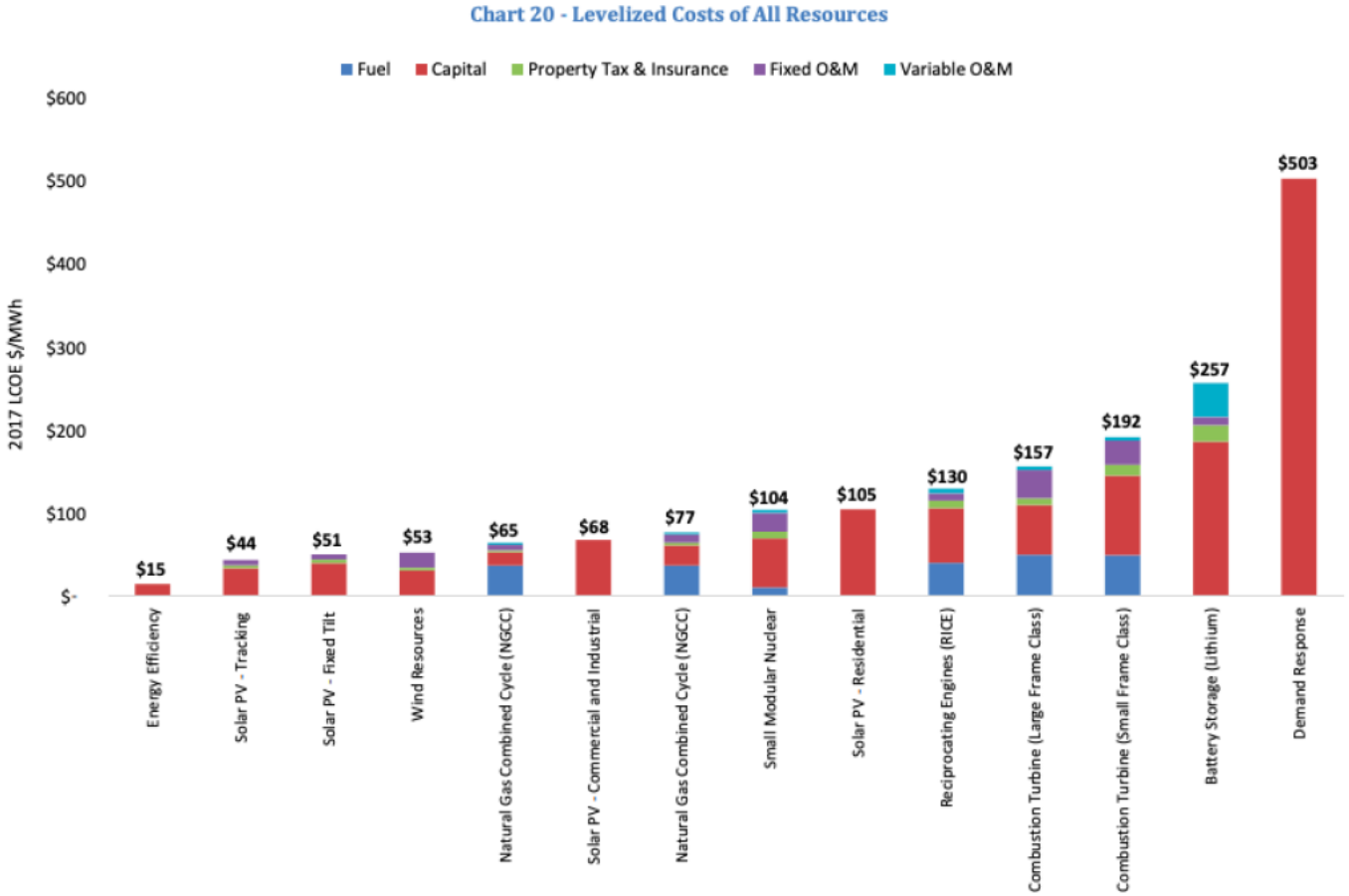
- Energy efficiency has created more than 40,000 family-wage jobs across our state, including more than 6,000 jobs in the Tucson area.[1]
- From 2010-2017, every **$1** of ratepayer money invested in energy efficiency in Tucson has returned **~$5** in benefits to all ratepayers.[2]
- Energy efficiency programs are the lowest-cost energy option available
  - Other options for Arizona customers cost 4-30 times more!



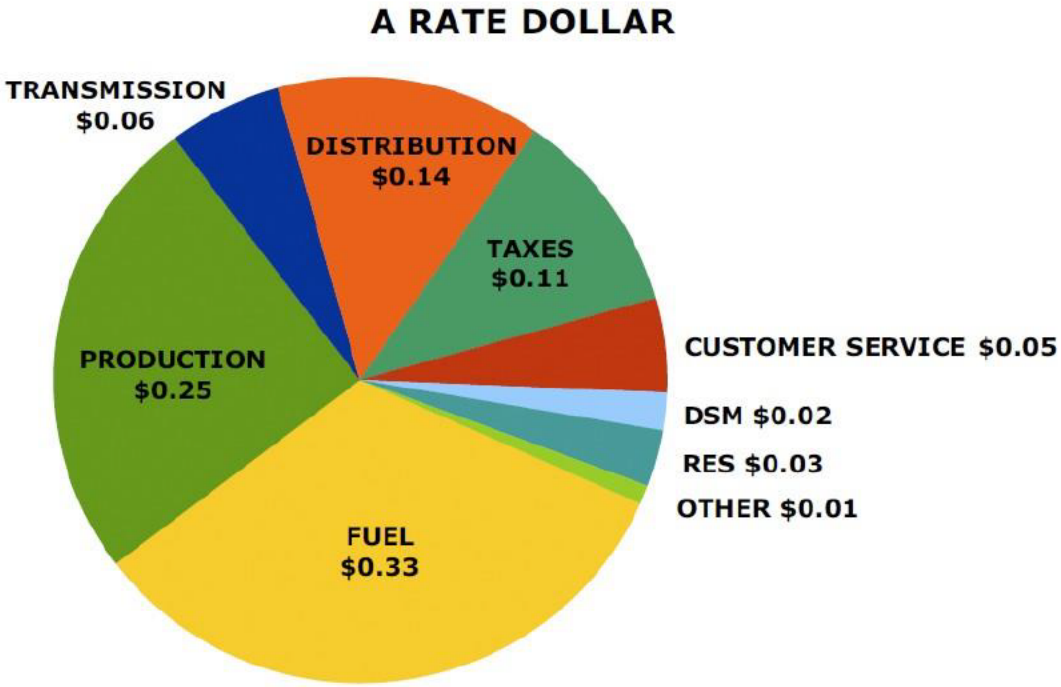
(1) https://www.e2.org/wp-content/uploads/2018/09/ARIZONA-Dist.pdf

(2) 2010-2017 Annual Demand Side Management reports of Tucson Electric Power filed with the Arizona Corporation Commission

Energy Efficiency is the Least Expensive Energy Resource Available to Meet Customer Needs



How Much Do We Invest in EE?



DSM = Demand Side Management = Energy Efficiency + Demand Response
RES = Renewable Energy

Source: Arizona Public Service, APS 2012 Rate Case

Energy Efficiency Technologies

Source: SRP 2014 Energy Efficiency Annual Report

Slide from Arizona State University

DSM Portfolios, Programs, and Measures in AZ

AZ DSM Portfolios

aps

SRP

TEP

UNS Energy Corp.

[Others]

Example Programs: TEP

Residential Programs:
- Low-income Weatherization
- Residential New Construction
- Shade Tree Program
- Efficient Products
- Existing Homes Retrofit and Audit Direct Install
- Multi-Family
- Appliance Recycling

Non-Residential Programs
- C&I Comprehensive
- Small Business/Schools
- Commercial New Construction
- Bid For Efficiency
- Retro-Commissioning
- Combined Heat and Power (CHP)

Behavioral Sector
- Behavioral Comprehensive

Support Sector
- Consumer Education and Outreach
- Energy Codes and Standards

Utility Improvement Sector
- Conservation Voltage Reduction
- Generation Improvement and Facilities Upgrade
- C&I Direct Load Control Program

Example Measures: Small Business/Schools

1. 14/15/16 SEER Packaged and Split ACs
2. 14/15/16 SEER Packaged and Split HPs
3. Advanced Power Strips, Load Sensors, Occupancy Sensors, Timer Plug Strip
4. Anti-sweat Heater Controls
5. Beverage Controls
6. Day lighting Controls
7. De-lamping
8. Energy Efficiency Exit Signs
9. Evaporative Fan Controls
10. Hard Wire CFL
11. HIDs to T8/T5
12. High Efficiency Evaporator Fan Motors
13. Induction Lighting Interior
14. Integral Screw In CFL
15. Integrated Case Control and Motor Retro-fit
16. LED Interior
17. Occupancy Sensors
18. Outdoor CFL
19. Programmable Thermostats
20. Refrigerated Display Automatic Door Closers
21. Strip Curtains
22. Variable Speed Drives

Slide from Arizona State University

TEP's Rebates/Discounts

Energy Efficient Home Program

- Receive $900 rebate and receive a new highly efficient air conditioner/heat pump with early retirement of a qualifying existing system.
- Receive a $300 rebate for duct sealing and repair.
- Receive a variety of rebates for AC tune-ups that include refrigerant charging repair and indoor coil cleaning.

Smart Thermostat Rebate

By installing a Nest Thermostat, participating customers will receive a $35 bill credit per thermostat.

Energy-efficient Pools

Customers can receive a $195 instant rebate off the price of a qualifying energy efficient variable-speed pool pump through a verified pool professional.

Trees for You

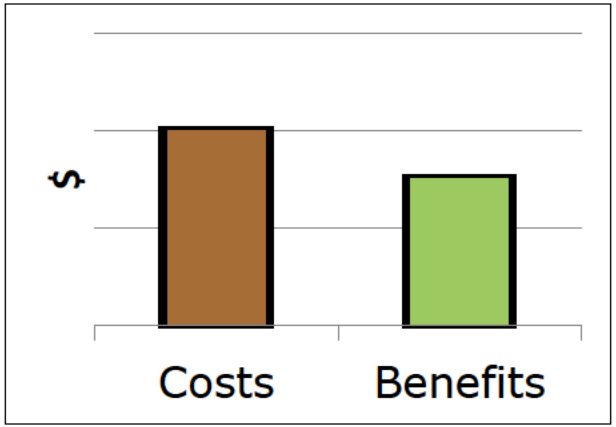
Program that offers many types of shade trees at a discounted price that provide shade, beautify neighborhoods, and save energy.

EE: Required to be Cost Effective

What does “cost effective” mean?

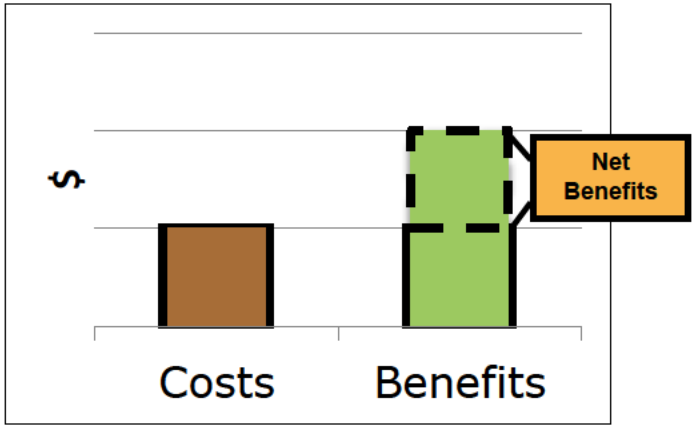
- Every $1 spent delivers at least $1 back in benefits
  - (benefit/cost ratio ≥ 1.0)
- The benefits of EE ≥ its costs

NOT Cost Effective



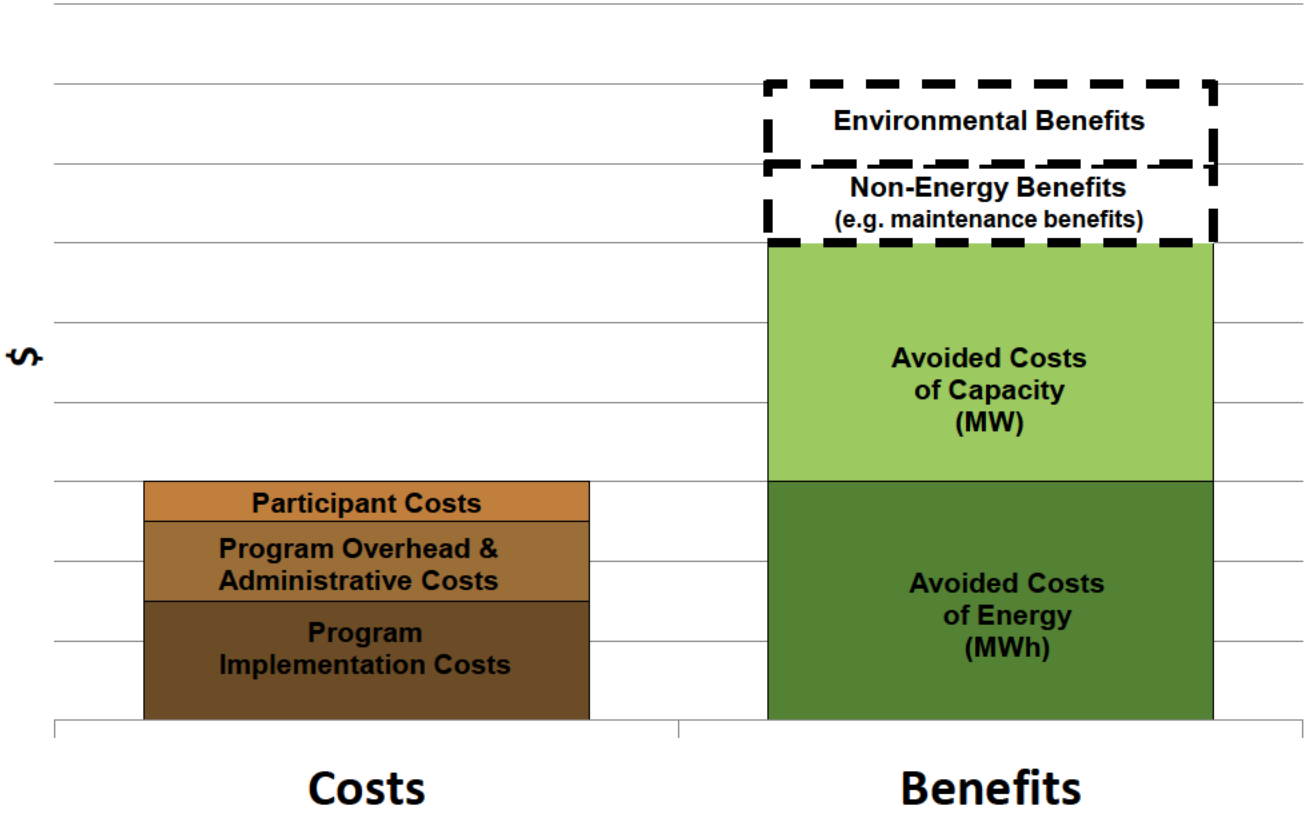
Costs exceed benefits; benefit/cost ratio < 1

Cost Effective

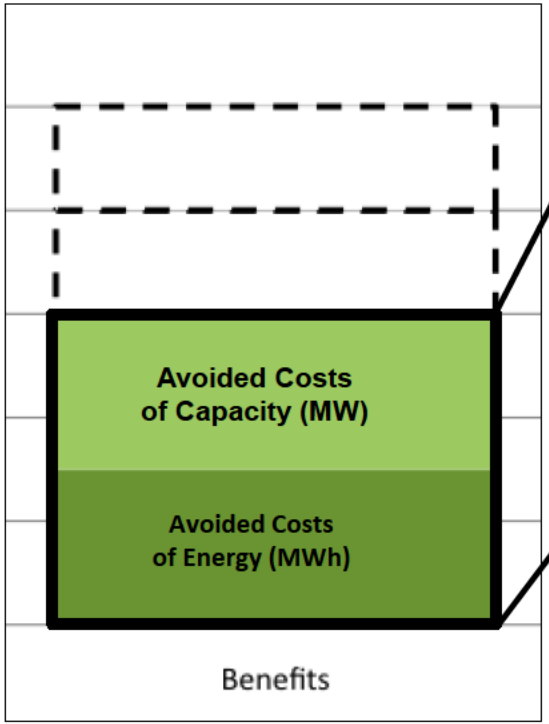


Benefits exceed costs; benefit/cost ratio ≥ 1

Arizona's Cost Effectiveness Test



What the Benefit-Cost Ratio Means



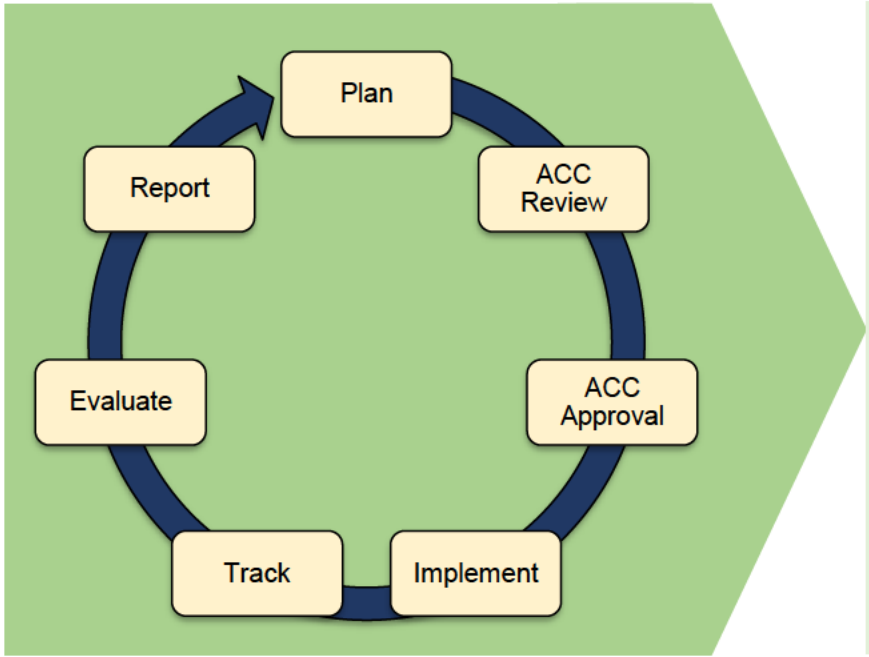
The test uses
avoided ***marginal*** costs

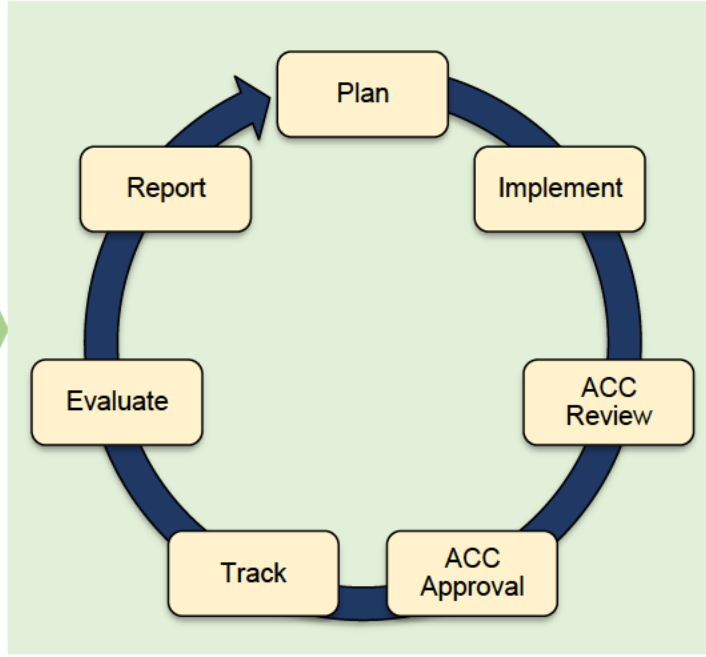
Therefore the test compares EE with the best supply resource (e.g. natural gas plant)

A benefit-cost ratio ≥ 1.0 means the EE investment is an equal or better investment than the next best available option
(and this is without considering all the benefits)

The Commission does not pose this question explicitly for any resource other than EE

Energy Efficiency Approval Process

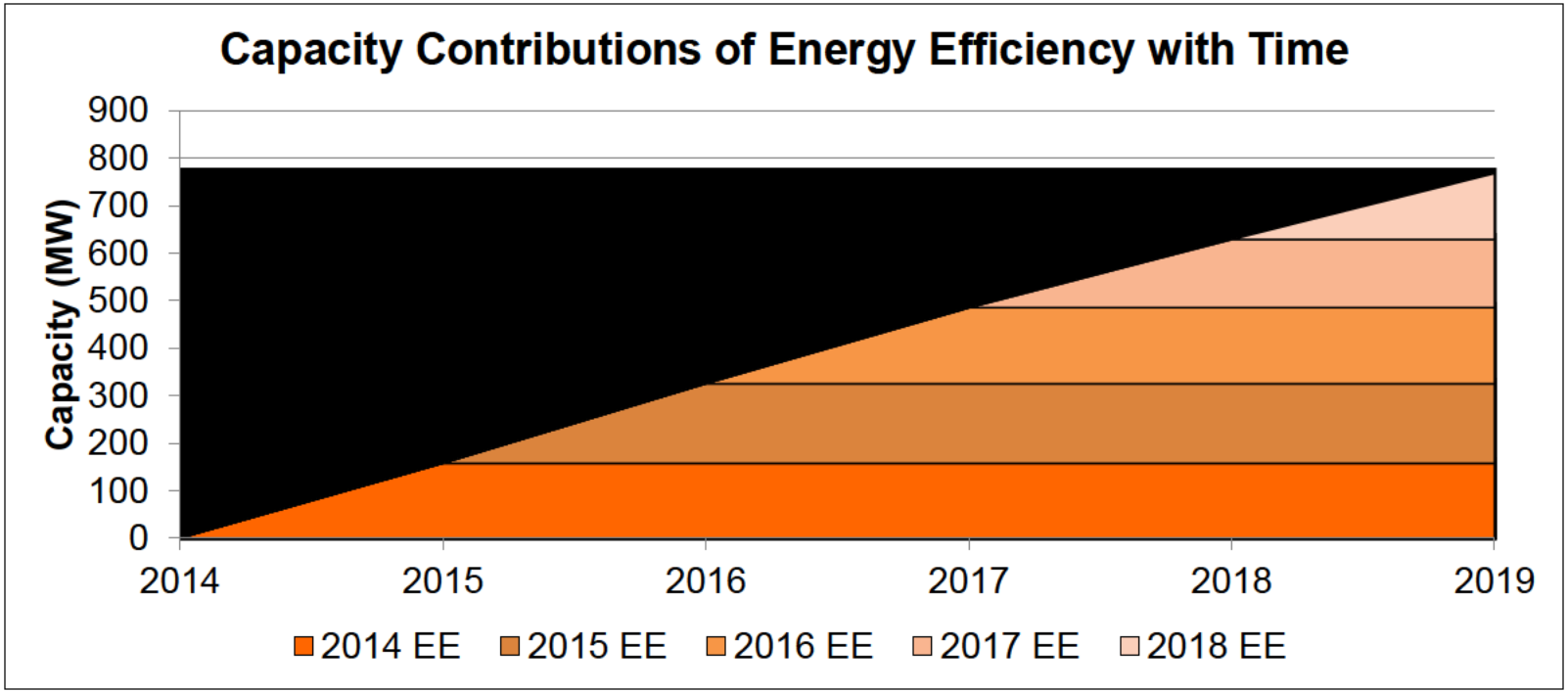




- Programs and measures are reviewed for cost effectiveness by the utility companies before they file their annual DSM implementation plans.
- ACC Staff review the cost effectiveness of each plan's programs and measures and develop a recommendation for Commission consideration.
- Commissioners review the cost effectiveness of the plan when they vote to approve or deny the Commission Staff's recommendation.
- Implemented programs and measures are tracked in the field and adjustments are made to achieve cost effectiveness as needed.
- Independent third-party evaluators are used to assess the performance of programs and measures in the field.
- The utilities report the program results on a semi-annual and annual basis.
- These results feed into the development of the next plan.

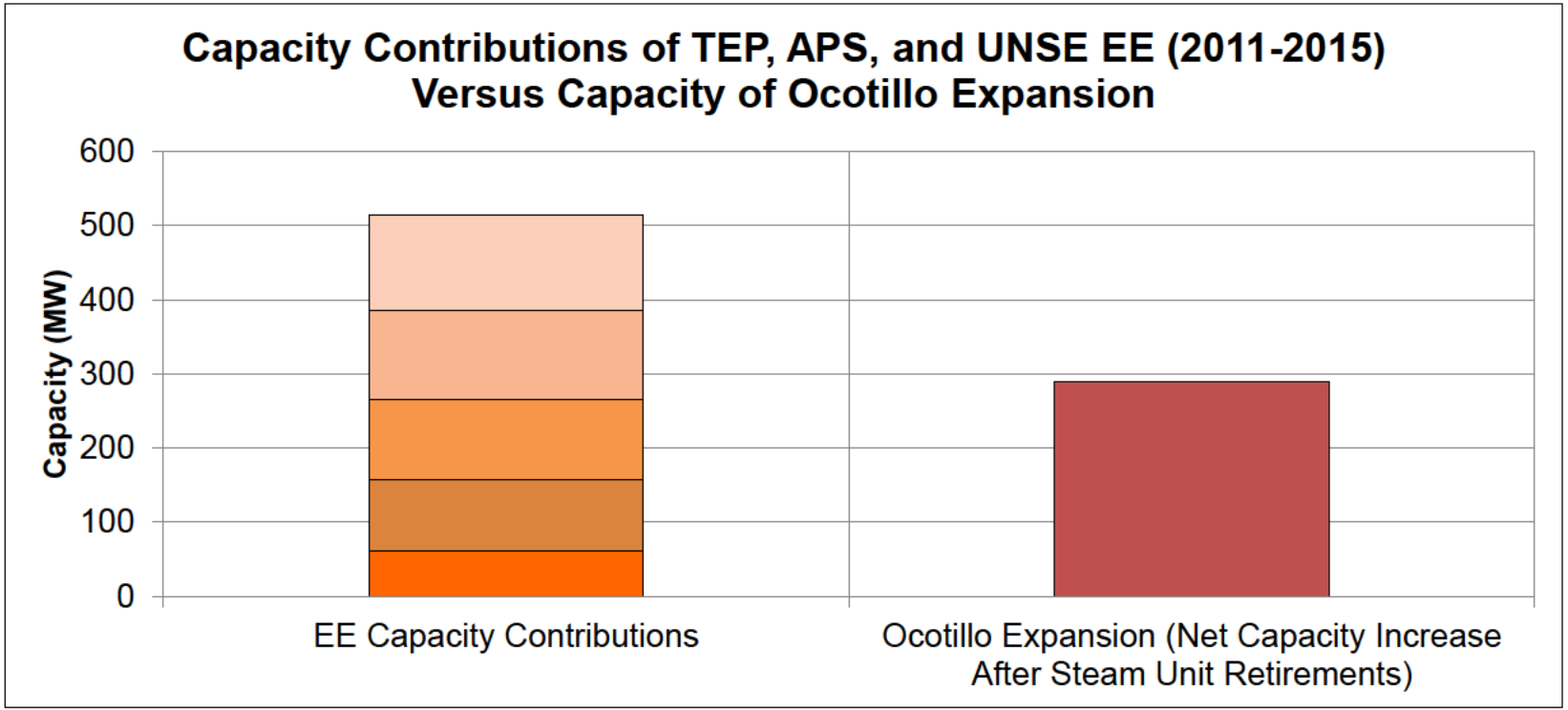
2) Energy Efficiency In Utility Resource Planning

Energy Efficiency Resources Build Up Capacity Over Time



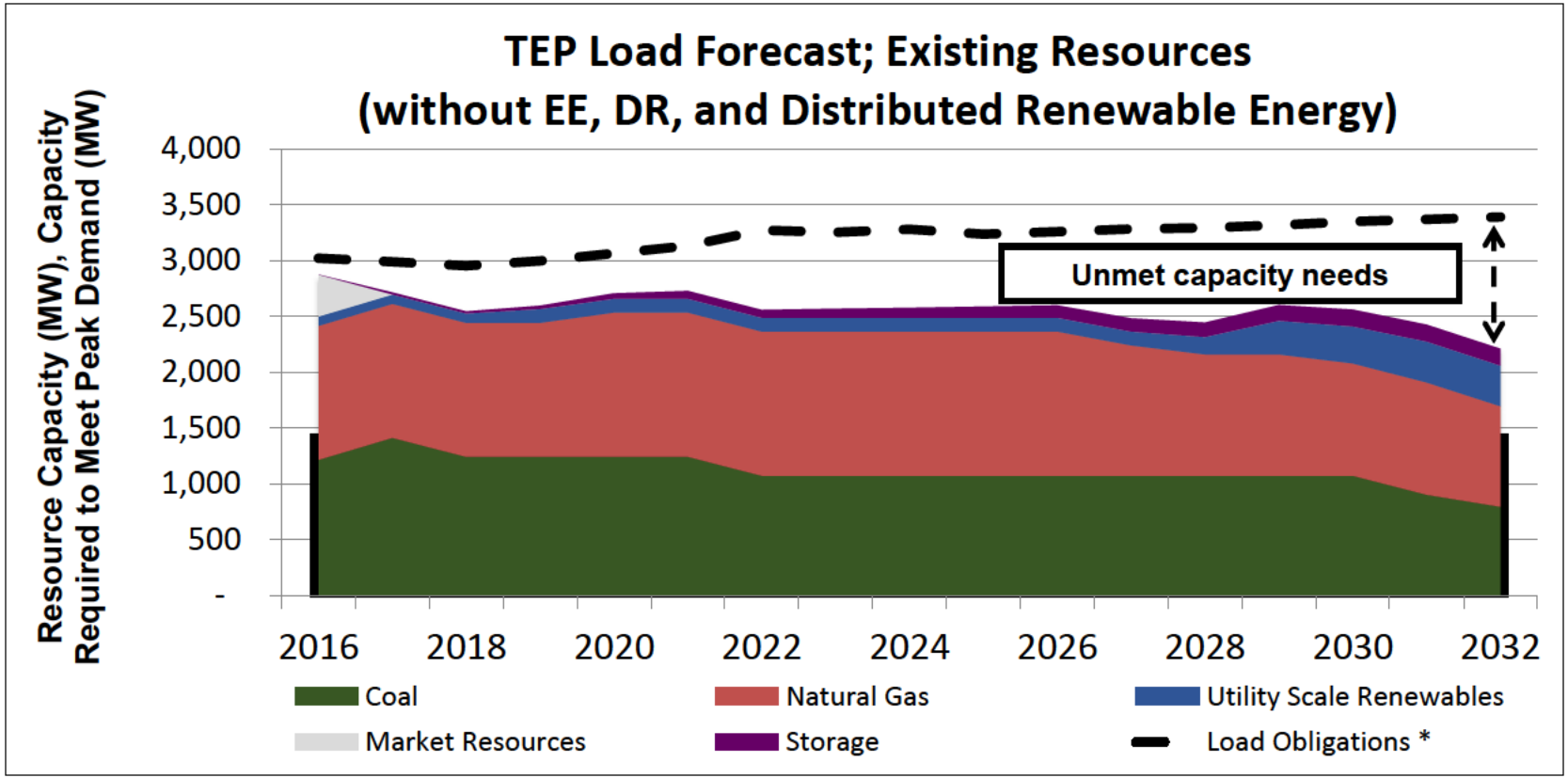
EE programs build up capacity resources over time, as customers make decisions on buildings, appliances, and equipment, and as EE measures are installed. For example, when an EE measure such as attic insulation is installed, that attic insulation will deliver capacity benefits in the year that it is installed and in subsequent years (as the insulation is not removed). In this way, EE resources implemented in any one year continue to deliver capacity benefits for multiple years. In addition, EE resources implemented in subsequent years build on the contribution of EE resources implemented earlier.

Capacity Provided by EE Investments From 2011-2015 is Far Greater than Recent Supply Side Additions that are Comparatively More Expensive



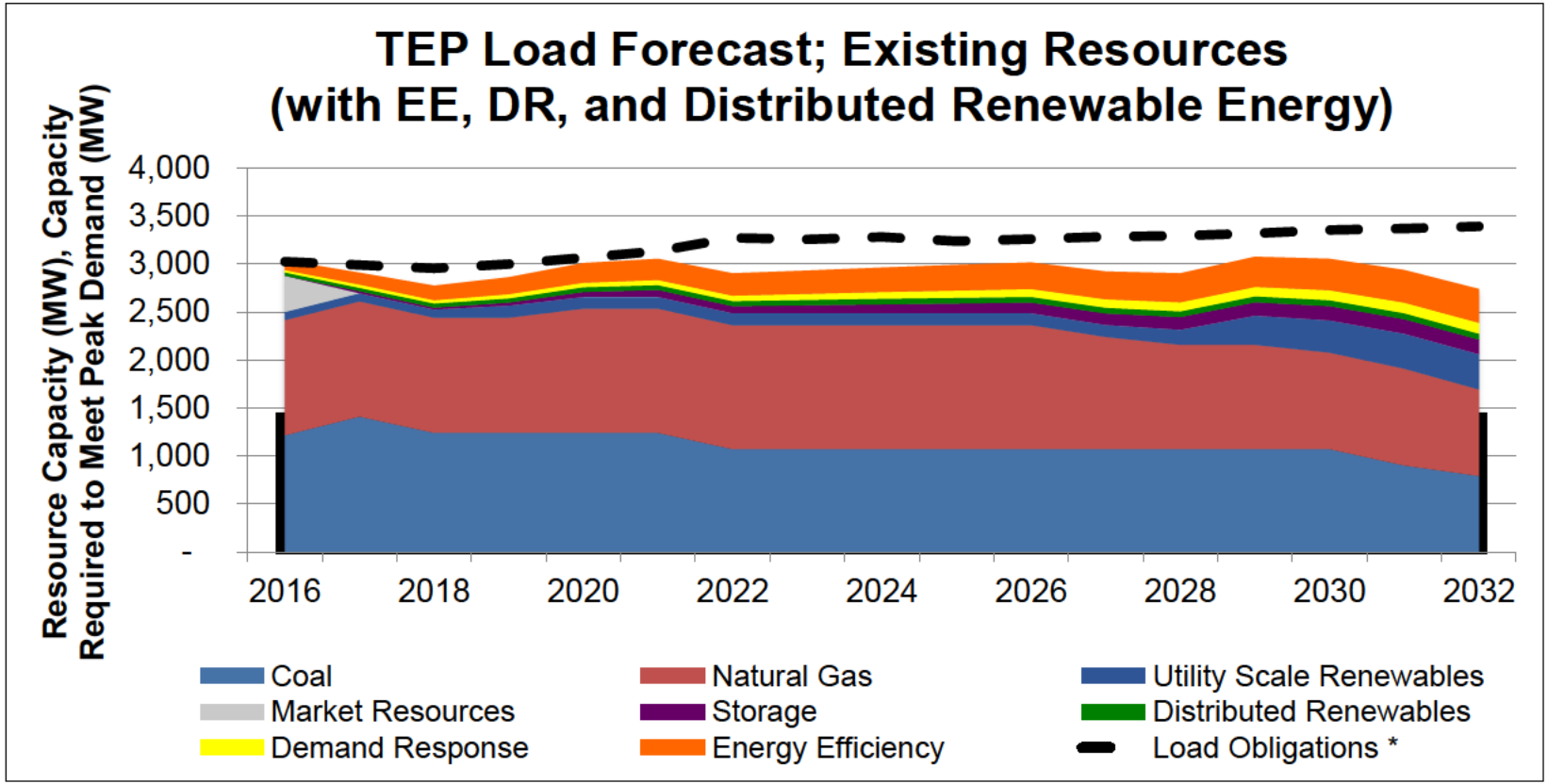
Data Source: Arizona Public Service 2011-2015 DSM Reports; Tucson Electric Power 2011-2015 DSM Reports; UNSE 2011-2015 DSM Reports; Arizona Public Service 2014 IRP. Capacity contributions from demand response and behavioral energy efficiency programs were excluded.

TEP has Unmet Capacity Needs Over the Next 15 Years



* Load obligations are without effects of EE, DR, and DG; and include a 15% reserve margin. Data Source: Tucson Electric Power (TEP) 2016 Preliminary Integrated Resource Plan and Supplement.

EE Helps TEP to Meet its Unmet Capacity Needs



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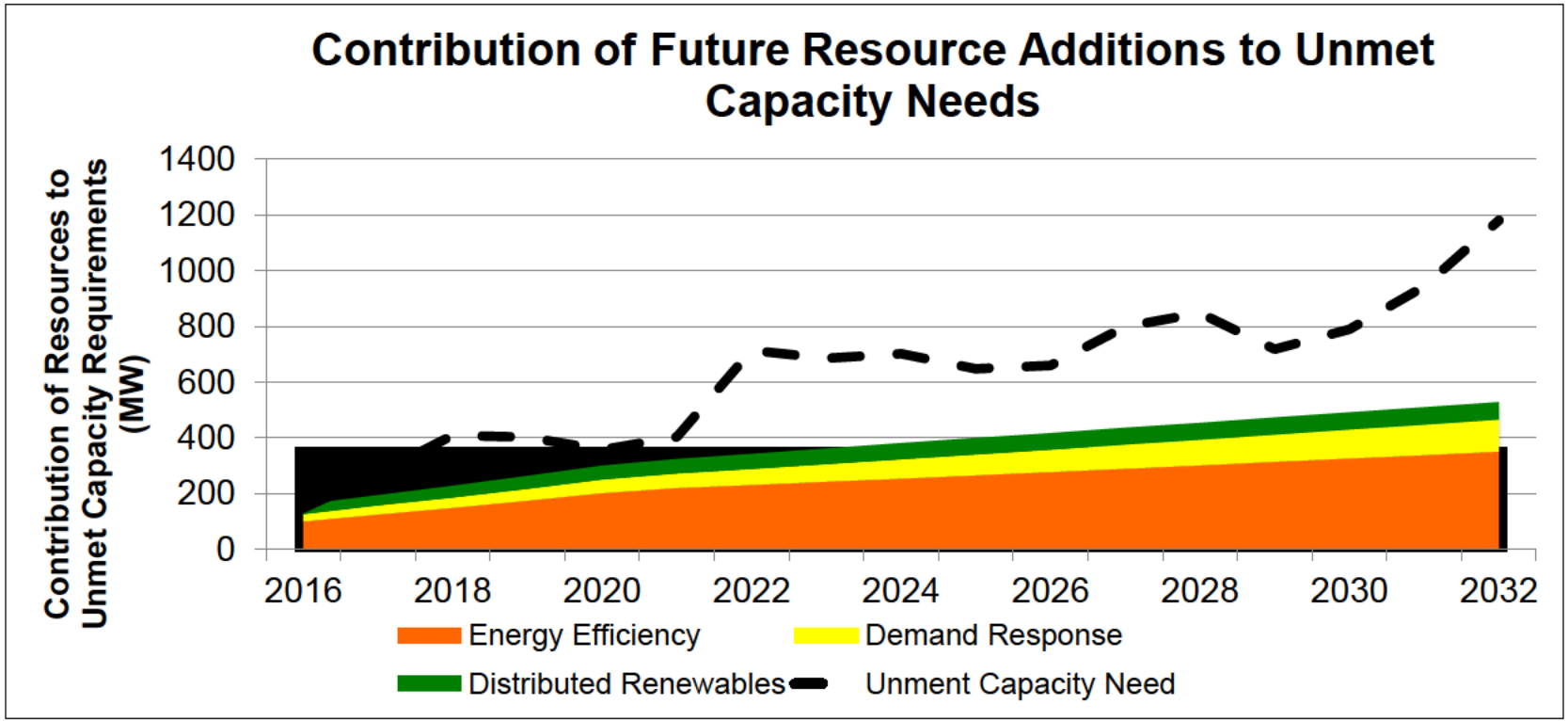
EE Meets Between ~30-55% of Unmet Capacity Needs Each Year Over the Next 15 Years



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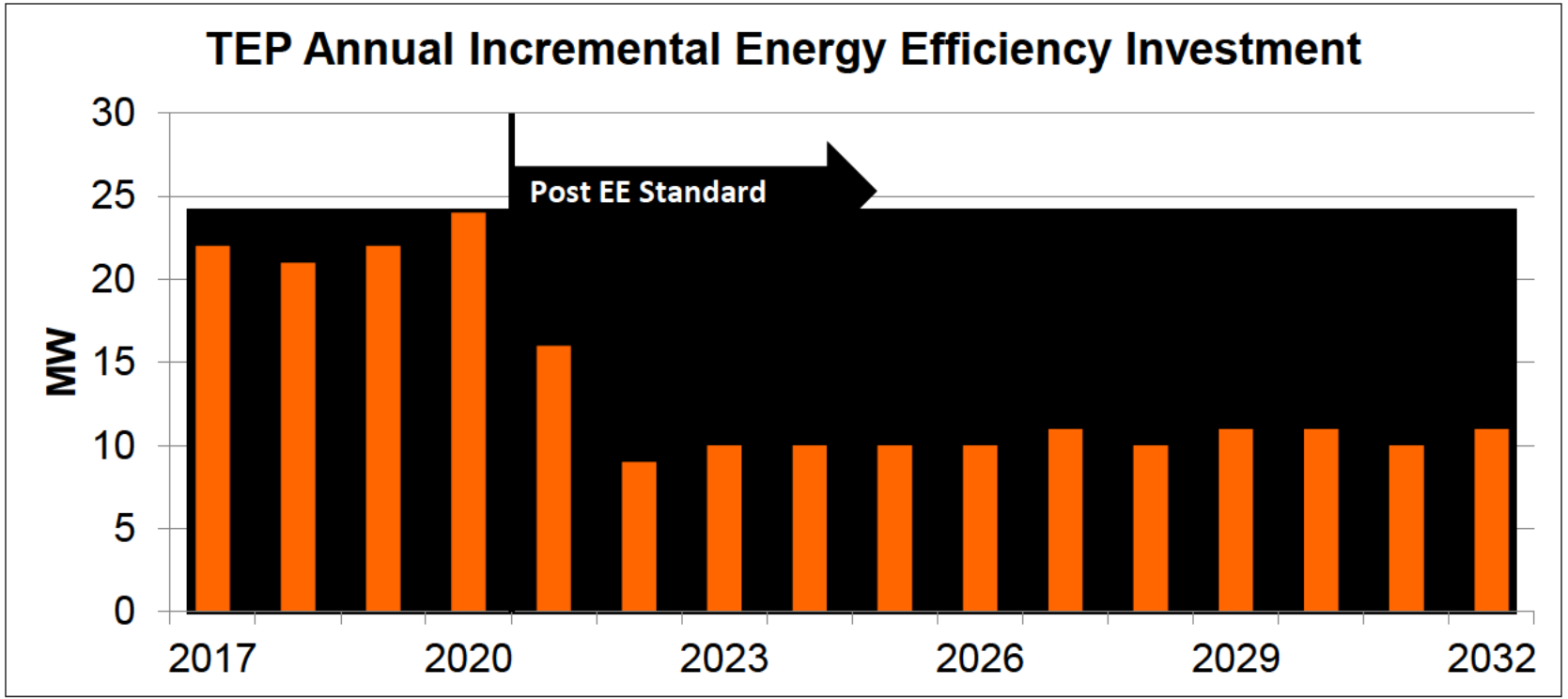
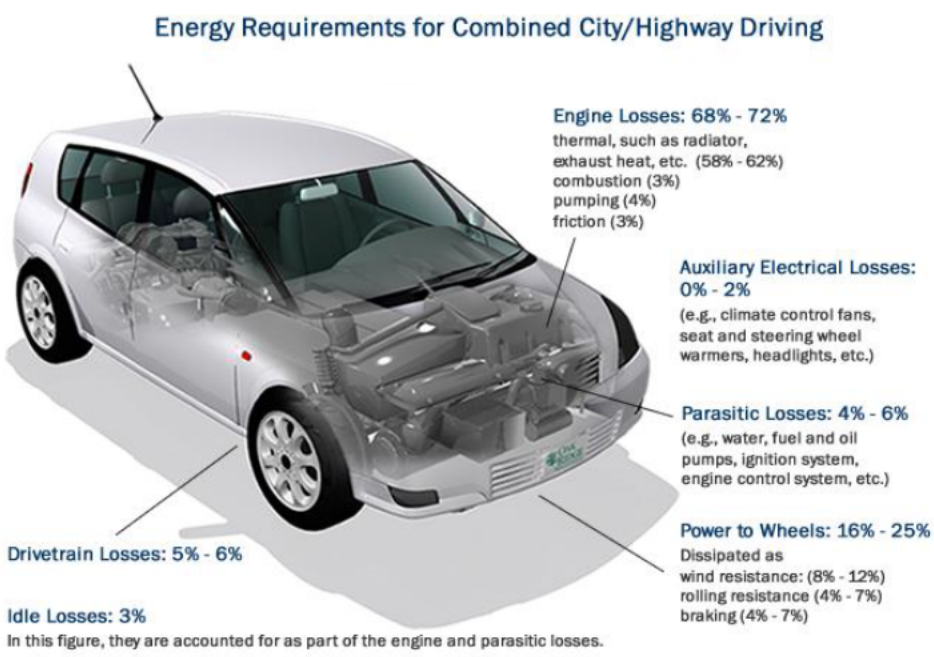
TEP Slows its Investment in EE After the EE Standard Sunsets

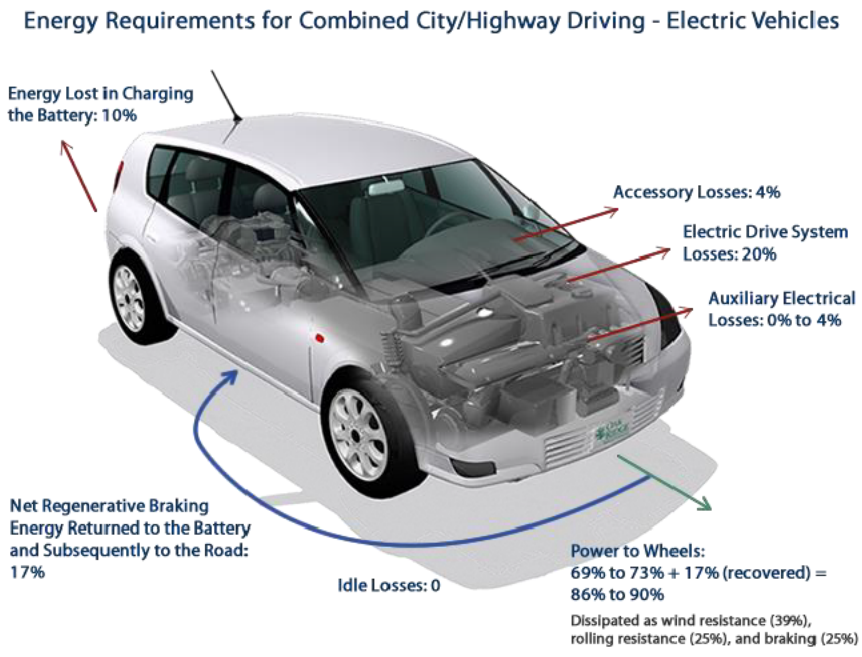


Data Source: Tucson Electric Power (TEP) 2016 Preliminary Integrated Resource Plan and Supplement.


3) Transportation Electrification

Efficiency in Gas-Powered Cars vs Electric Cars



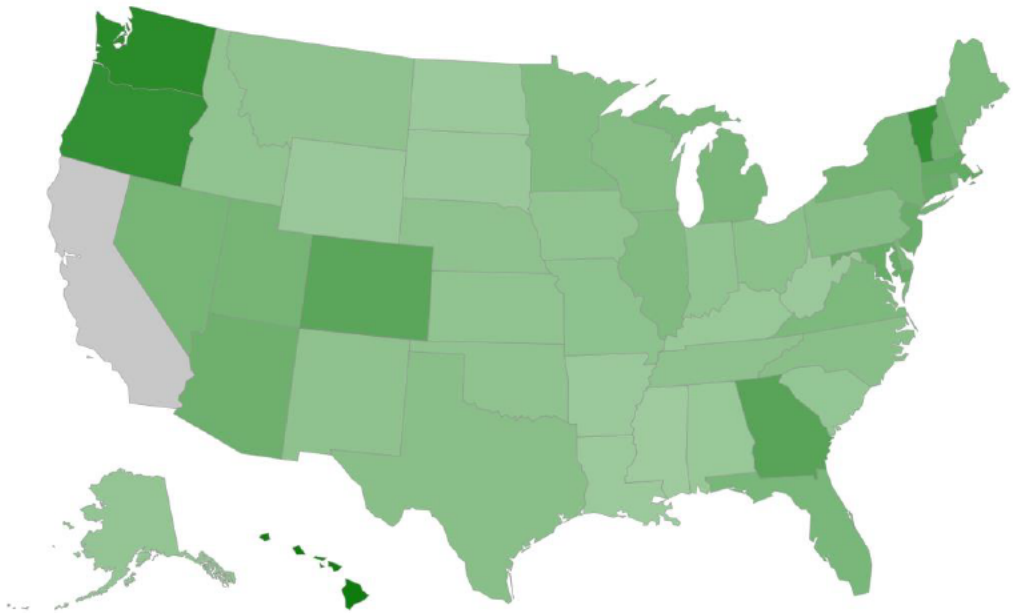


An EV electric drive system is only responsible for a 15% to 20% energy loss compared to 64% to 75% for a gasoline engine!

Source: https://www.fueleconomy.gov/feg/atv-ev.shtml

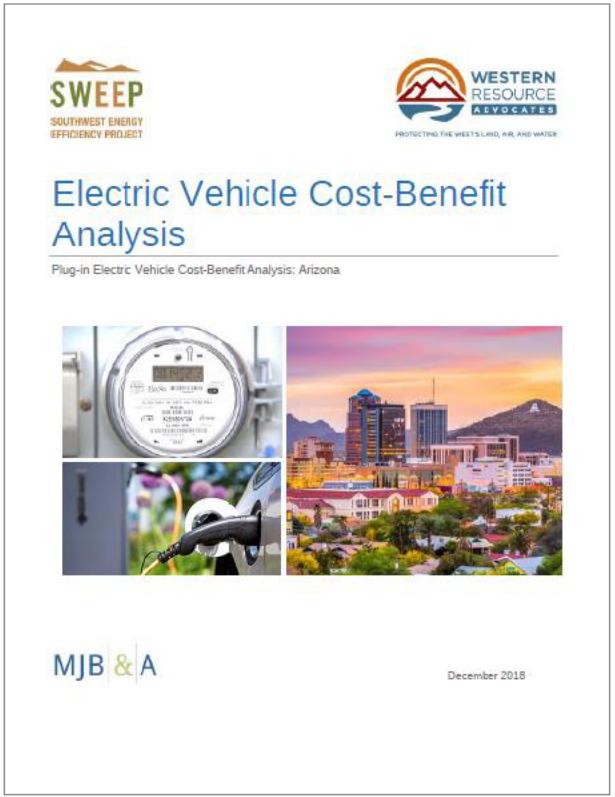
Electric Vehicles (EVs) Will Grow in AZ & Nationwide

- As of 2018, Arizona ranked **15th** in the nation for electric vehicle sales. 14,720 EVs were registered in Arizona as of August of 2018.
- By August of 2018, **3,677 PEVs** were purchased in Arizona - a significant uptick when compared with 2,976 in all of 2017.
- There will be over 100 EV models available by 2022, and over 20 SUV models.
- Consumers in Arizona will be able to buy an EV, and ratepayers will see savings, as long as charging is properly addressed.



Sources: Auto Alliance & Atlas Public Policy 2018 Data: https://www.atlasevhub.com/

EVs can promote innovation, increase energy efficiency, and lower Arizonans electric bills



Electric vehicle benefits

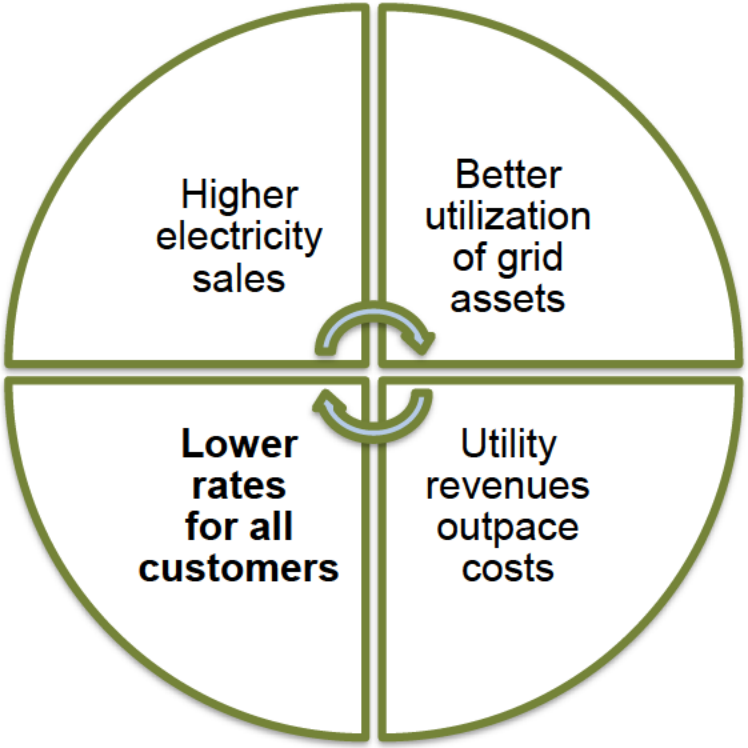
- Utility bill savings for ratepayers
- EV driver savings
- Economic development benefits
- Environmental/public health benefits

Impacts on utilities

- Energy sales
- Utilization of electric system assets
- Demand for charging stations
- Peak loads

https://www.swenergy.org/pubs/azevstudy

With More EVs, Charging Off-Peak, AZ Ratepayers Can Realize Major Benefits and Cost Savings



1. More EVs means more sales of electricity.
2. More sales of electricity during off-peak times means better utilization of grid assets.
3. Better utilization of grid assets (grid efficiency) means revenues outpace costs.
4. Higher utility revenues, outpacing utility costs, means lower rates for all ratepayers, even if they don't own an EV!

EVs: Scenarios Modeled in MJ Bradley Study

Moderate PEV Adoption Scenario:

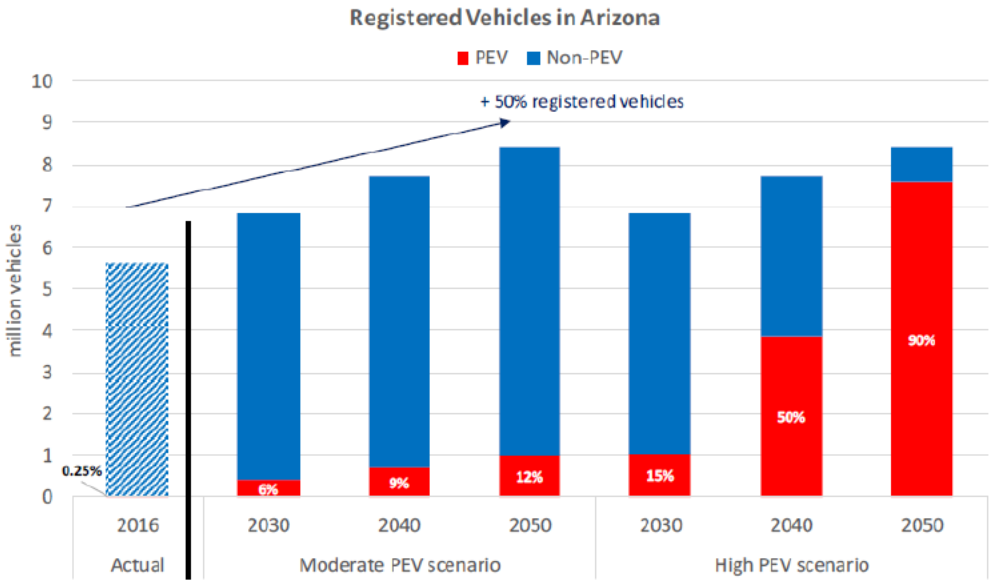
- 400,000 PEVs in Arizona by 2030, 1 million by 2050
- Consistent with the proposed Energy Modernization Plan (EMP)

High PEV Adoption Scenario:

- 1 million PEVs by 2030, 7.6 million by 2050
- 90% of light duty vehicles are PEVs in 2050
- 85% of vehicle miles traveled

Energy Mix:

- 80% zero carbon by 2050
- Consistent with the proposed EMP



** PEVs include plug-in hybrid electric vehicles and battery electric vehicles.*

Total Net Benefits of $31 Billion by 2050

Benefits in 2050, High PEV Adoption

Environmental benefits

- Reduced NOx emissions – 2,900 tons
- Reduced CO_2 emissions – 26 million tons/yr ($220 M in compliance costs; $1.3B in avoided damages)

Utility customer savings

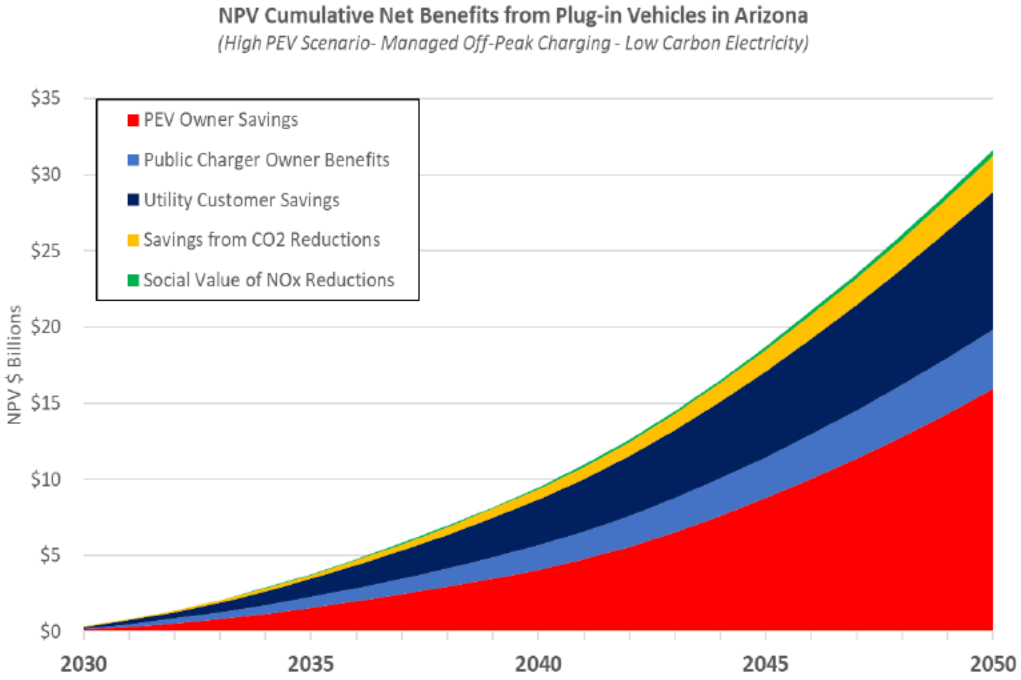
- With strategic charging ($176/year)
- "BAU" charging ($50/year)

Public charger owner benefits

- 440,000 L2 Chargers; 23,000 DCFC

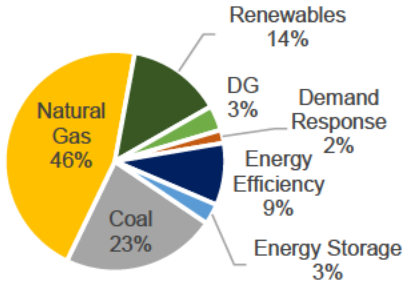
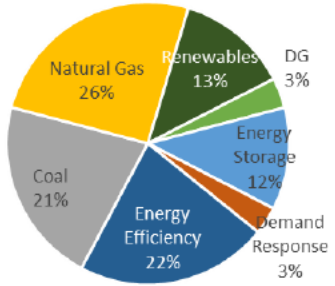
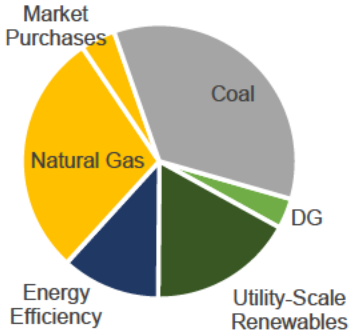
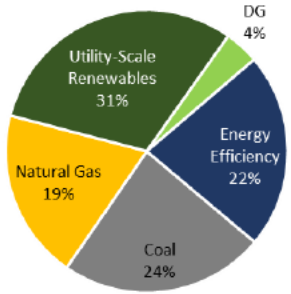
PEV driver savings ($590/PEV)

- Reduced maintenance costs
- Reduced fuel costs (cumulative savings of 370 million barrels of gasoline)



4) Independent Analysis Conducted By SWEEP/Strategen

Summary: Comparison of Portfolios

TEP Selected Portfolio	Alternative Portfolio
Capacity: Contribution to Peak, 2032 	Capacity: Contribution to Peak, 2032 
Energy Mix, 2032 	Energy Mix, 2032 

Capacity Expansion & Load Forecast Modeling

- SWEEP is working with Strategen to create an independent capacity expansion and load forecasting model to identify:
  - Which energy resources achieve the carbon reductions TEP needs to be consistent with Intergovernmental Panel on Climate Change guidance's while maintaining low rates for customers.
  - Which investments will assist TEP in retiring coal units as quickly as economically possible while considering those impacted by power plant closures.
  - How to invest in renewable energy combined with storage to take full advantage of the intermittent power at the cheapest times of the day.
  - Which resource planning scenario will best include customer resources, like EE, DR & DG.
  - How to maximize the amount of TEP customers that have their electric vehicle charging, "*managed*."
  - How population growth impacts variable cost, fixed costs, and energy demand.

Strategen Analysis Timeline

December 2019 – January 2020: Data collection and detailed discussions of final products

February 2020: Run analyses

March 2, 2020: TEP IRP advisory group presentation

March 13, 2020: Tentative deadline on modeling results

Thank you!

Ellen Zuckerman
Arizona Representative
Email: ezuckerman@swenergy.org

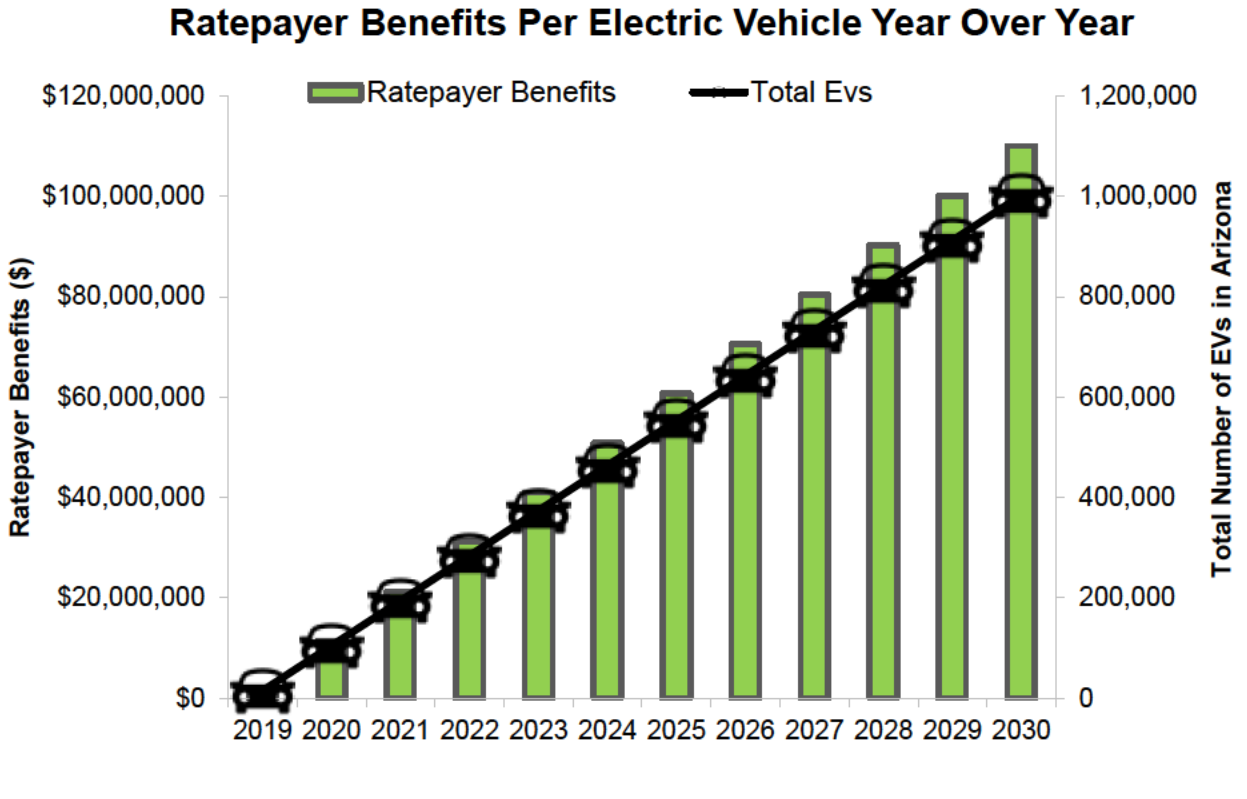
Caryn Potter
Program Associate
Email: cpotter@swenergy.org

SWEEP

Ratepayer (Non-EV Driver) Benefits In Next Decade

- Arizona ratepayers can realize benefits as early as 2019.
- If only 15,000 EVs are purchased this year, the ratepayer benefits are **$1,646,707**!

**This graph is meant to illustrate the relationship between EV sales and economy-wide benefits. Based on historic trends, both EV sales and the associated benefits are more likely to follow exponential rather than linear growth curves*



Source: SWEEP