

# San Antonio's Energy Future

A Faster, Less Risky, More Flexible, Greener Approach to Meet Our Energy Needs

Or...

What could you buy for \$2.6 billion?



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# Preface

- CPS Energy originally proposed that they needed 40% of the output of the two proposed nuclear reactors in Bay City, or 1080 MW.
- CPS Energy and Mayor Castro have now floated an alternative proposal of 20% of the nuclear output or 540 MW.
- This presentation is meant to show that if they did need to fill a gap in demand of 540 MW, San Antonio has more options at cheaper costs.
- Whether or not City Council decides to say yes to 40%, 20% or 0% of the proposed nuclear plant, today CPS Energy has an announced commitment- and all the associated risks- to 50%<sub>o2</sub>

# There are alternatives that CPS Energy has not explored

- Mission Verde fully realized;
- More efficiency than 771 MW (STEP +);
- Combined Heat and Power Program;
- More on-site solar than a commitment to 100 MW;
- More off-site renewables: solar, wind, geothermal, and biomass;
- Utilizing storage including a solar-natural gas hybrid approach such as City of Houston and California has developed;
- Considering adding a natural gas plant or using market hedging to lock in historically low gas prices
- City Council should vote “no” on the nuclear option and instead commit to a more flexible, less costly, greener alternative

# Options to Replace 540 MW of Nuclear by 2020\*

## What could you do with \$2.6 billion?

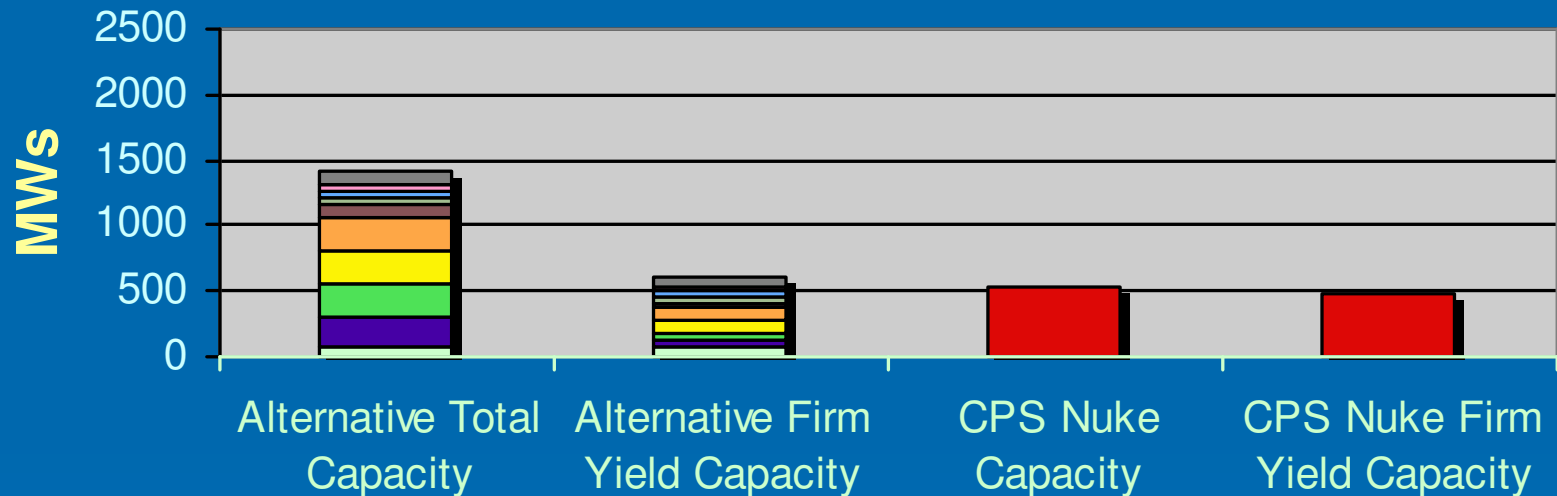
*Why not put our energy eggs into less risky baskets.*

- Add 220 MW of Additional Energy Efficiency Cost: \$110 to \$570 million
- Install 250 MW of Wind Cost: \$500 Million
- Develop a 250 MW Solar on Rooftops Program Cost: \$200 Million
- Develop 250 MW of Utility-Scale Solar (plus storage) Cost: \$500 million
- Install 100 MW of Wind Turbines plus Storage Cost: \$235 million
- Install 50 MW of Geothermal Cost: \$200 million
- Build a 50 MW Biomass Plant Cost: \$150 million
- Build a 100 MW Natural Gas Combined Cycle Plant Cost: \$80 million
- Implement 75 MW Combined Heat and Power Program Cost: \$185 million

TOTAL COST = \$2.4 billion

\*CPS Energy has stated that they only need 20% of the plant's output by 2020, which equates to **459 MW** given 85% capacity factor. They had previously advocated a 40% solution, or 1080 MW.

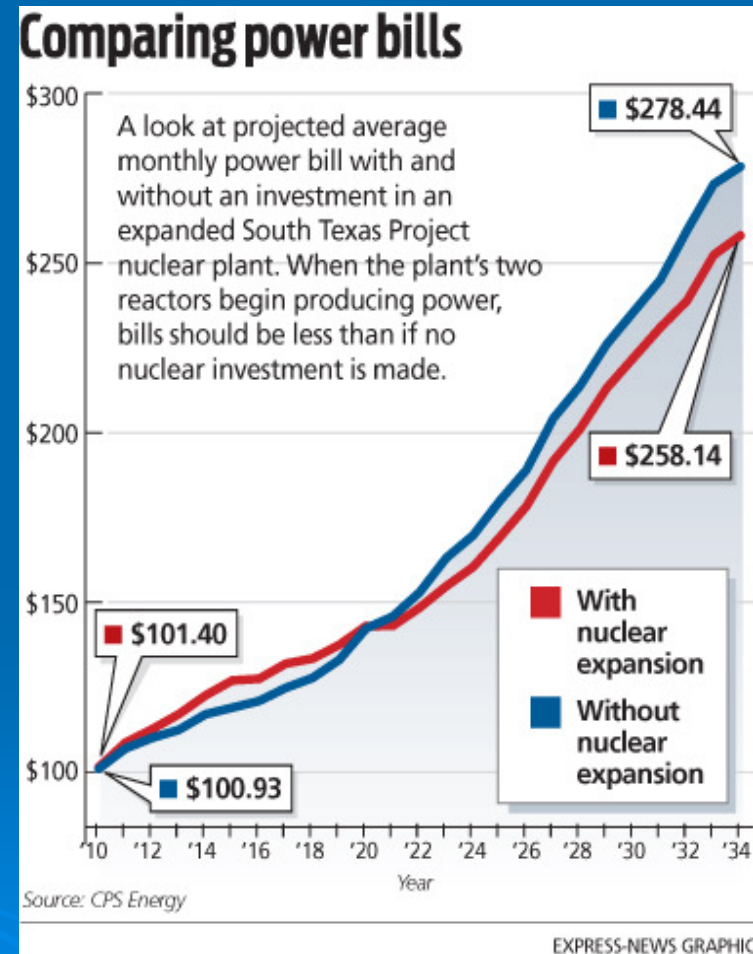
A cheaper, less risky, more flexible approach:  
 San Antonio can get 1,425 MW capacity  
 & 611 MW firm yield for less than \$2.6 billion



- Nuclear
- Onsite Solar
- Wind with Storage
- Combined Heat & Power
- Building Codes
- Offsite Solar
- Geothermal
- Natural Gas
- Advanced Efficiency
- Wind
- Biomass

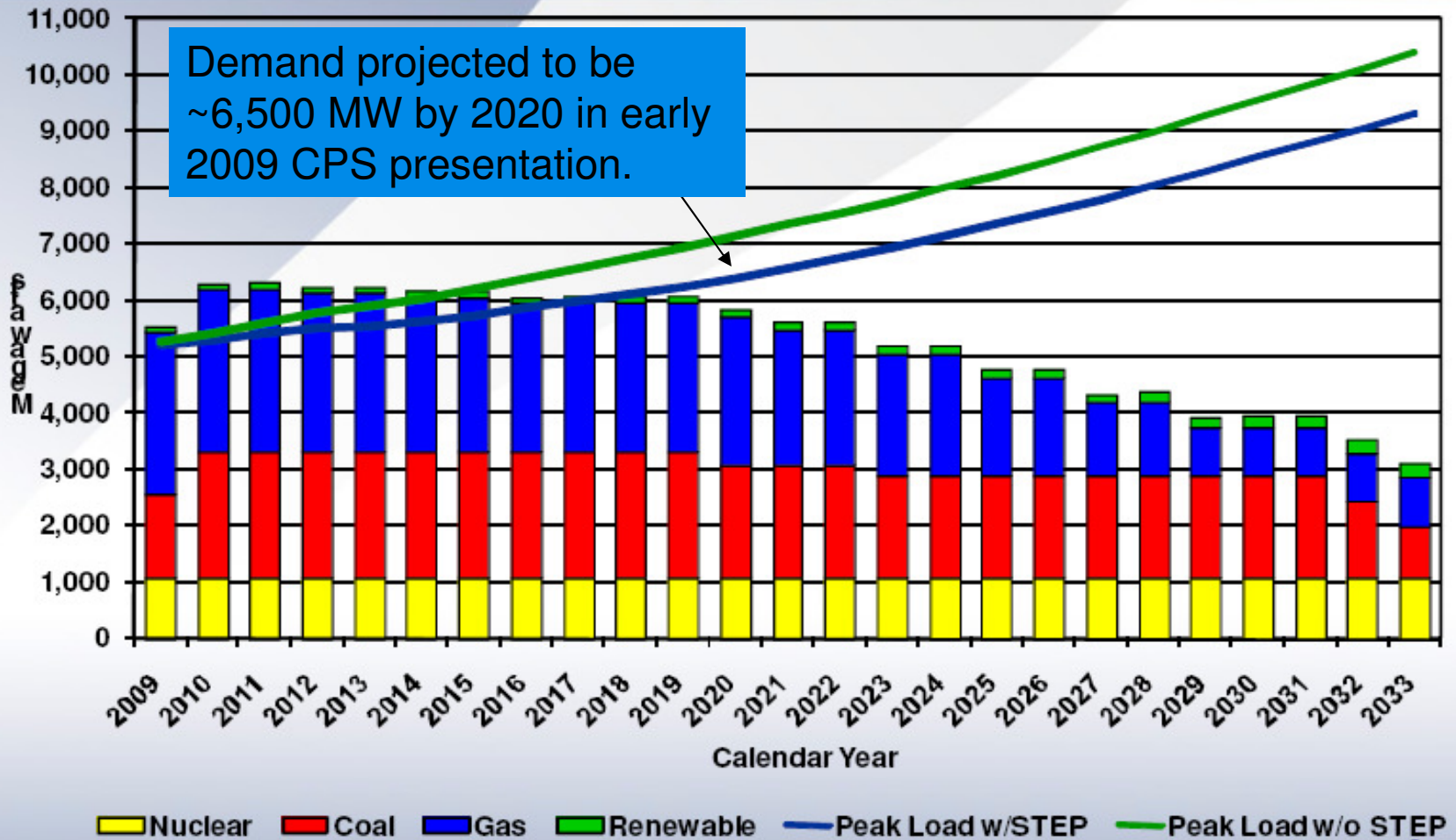
# What CPS Energy Tells Us: There are only two options

- Build the Nuke to meet the “gap” in demand, or don’t build it, and instead build natural gas plants and buy off the market;
- Building the Nuke is best long-term plan for San Antonio because of cost and reliability.
- Even with rosy assumptions, latest CPS analysis shows average bills rising by \$42 between 2011 and 2020 with a 20% stake in the Nukes.
- They conclude, however, that bills would rise more with the natural gas option, beginning in 2021 based on their assumptions for fuel prices.





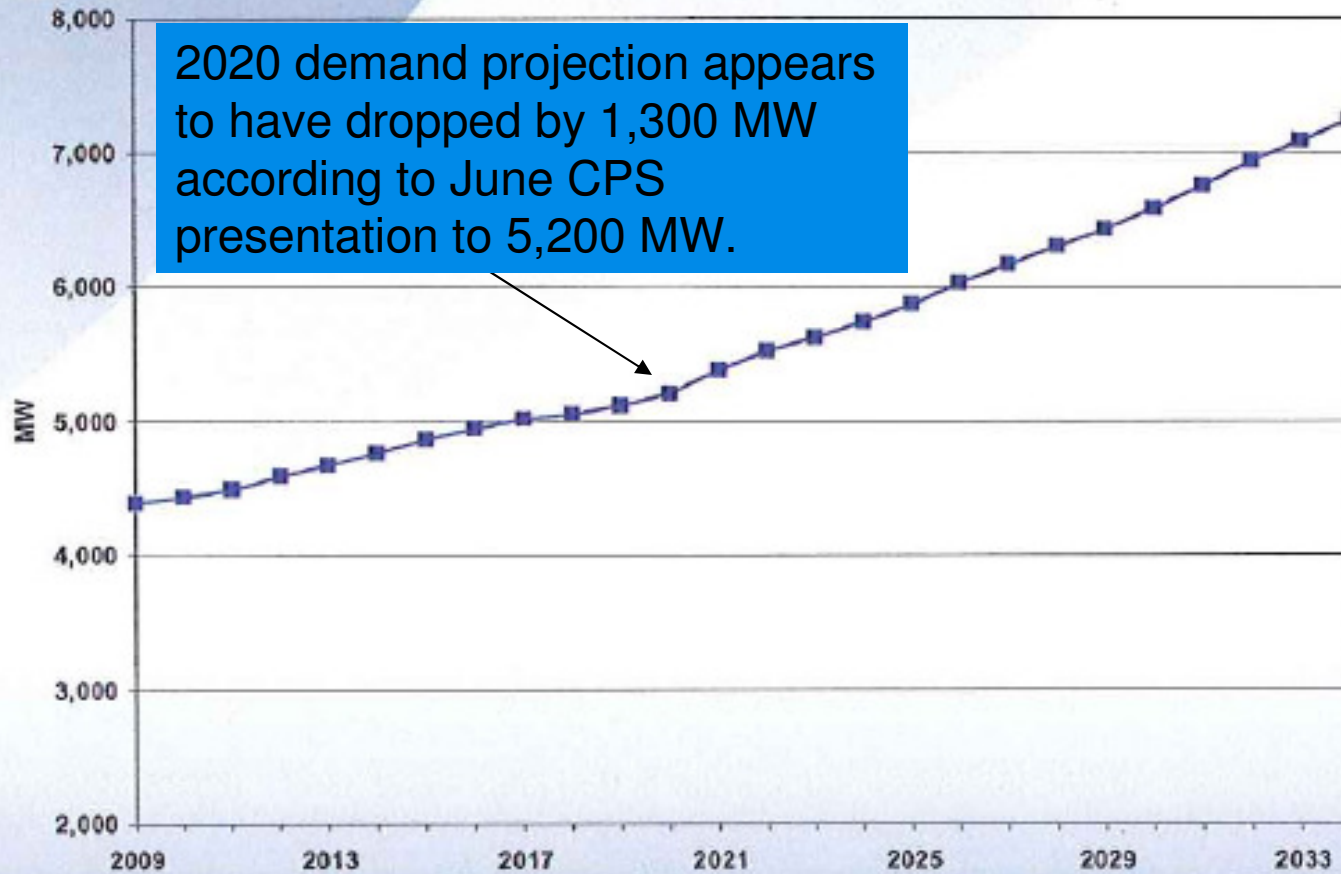
# Meeting San Antonio's Long-Term Economic Growth



Each of the peak load lines includes a 12.5% planning reserve margin.  
 STEP – Save for Tomorrow Energy Plan (Energy Efficiency & Conservation)



# Peak Demand Forecast (MW)



Note: Save for Tomorrow Energy Plan (STEP) is included.

Assumptions for 2009 Resource Plan Analysis - Public Version - June 29, 2009

7



# The CPS Plan: More Nukes, More Renewables, More Efficiency

Resource	Number of MW	Years	CPS Energy Estimated Capital Costs	Notes
Nuclear: STP 3 & 4	1080 MW 540 MW (20%)	Estimate would be to begin using some nuclear power by 2018	\$5,200 million \$2,600 million	Assumes \$10 billion plus \$3 billion in financing for total plant cost
Spruce 2	750 MW	Revised online date: 2010	\$1,000 million (2008 estimate)	Final cost unknown; promises of pollution reduction on other plants yet to be met;
Efficiency	771 MW of Demand Reduction	Through 2020	\$871 million	Based largely on Nexant study, part of Mission Verde goals
Renewable Energy	400 new MW of wind and solar	857 MW on contract by 2010, and 1,200 by 2020	\$2,571 million	Assumes meet 20 percent of peak demand by 2020 and increase renewables from approximately 850 to 1200 by 2020; includes at least 100 MW of solar

# Energy Efficiency & Demand Side Management



# The energy goals of Mission Verde

- Energy Efficiency (STEP): 771 MW
  - Green Jobs Estimate: Over 5,500 jobs
- Distributed Generation: 250 MW
  - Green Jobs Estimate: 1,100 jobs
- Retrofits: 30% of homes save 15% energy by 2015
  - Green Jobs Estimate: 320 jobs
- Building codes
  - 15% Savings starting in 2010 (IECC 2009)
  - 30% Savings starting in 2015
  - Zero Energy homes by 2030

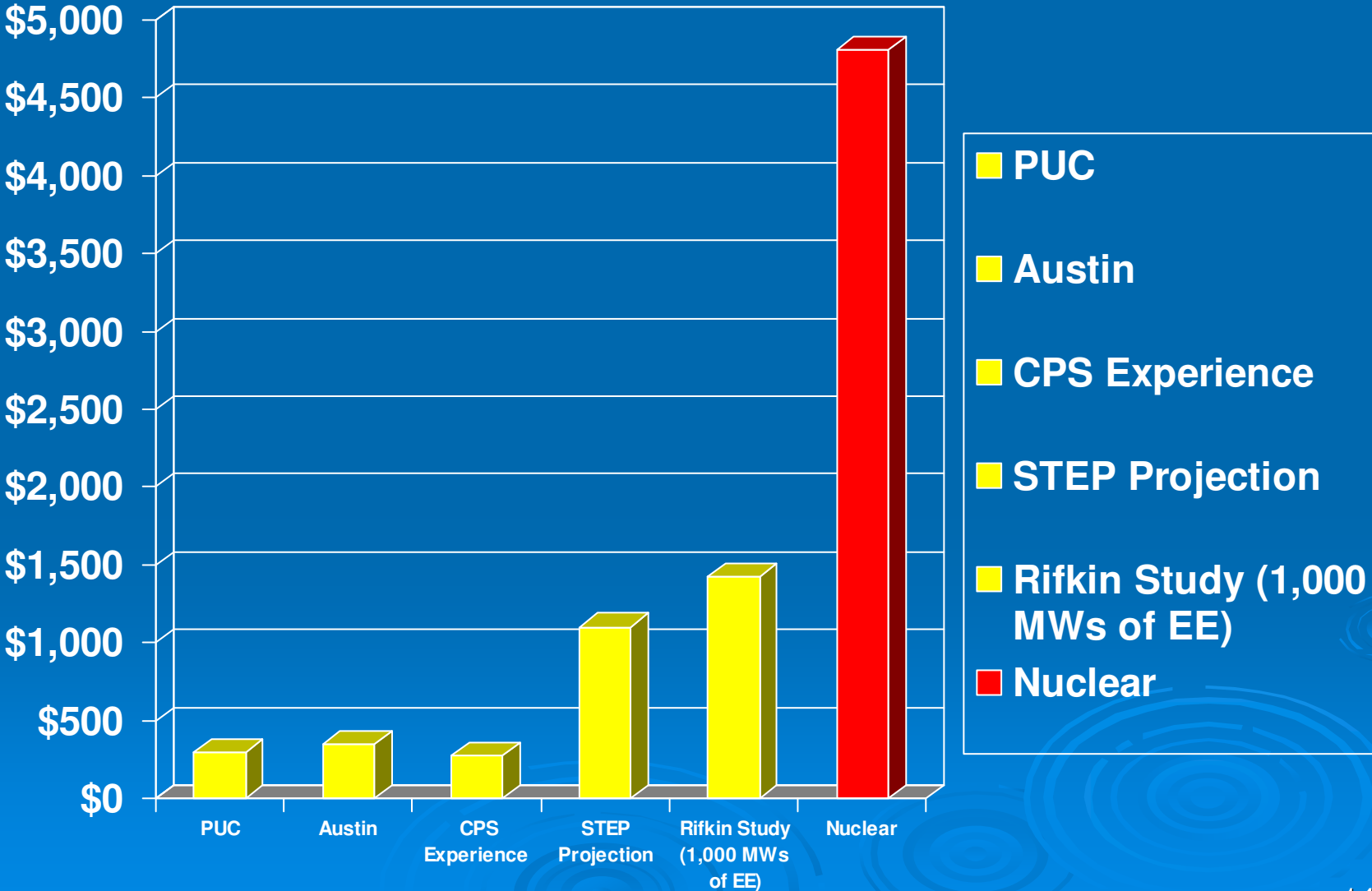
# Mission Verde

Initiative	Assumptions	Annual energy savings/generation			Local job creation		Annual greenhouse gas reduction	
		Megawatt-hours (MWh)	Equal to powering how many San Antonio homes?	Direct financial impact of energy savings	Permanent local jobs	Total annual salaries	Tons CO <sub>2</sub> equivalent	Equal to taking how many cars off the road?
Multi-Tech Venture Capital Fund	\$100M invested in attracting multi-tech businesses to San Antonio	--	--	--	3,000	\$100M	--	--
Solar distributed generation	9 jobs per MW, PV panels on 50,000 homes (3kW) and 6,000 businesses (16kW) → create 250MW capacity	400,000	30,000	\$30M	1,000	\$40M	250,000	40,000
Residential Green Retrofit	Benefits calculated for 2015 for 30% of San Antonio homes retrofit, 15% average household energy savings	300,000	20,000	\$25M	300	\$10M	200,000	35,000
City Facility Green Retrofit	All city facilities retrofit by 2015, 12% average facility energy savings	30,000	1,500	\$2M	20	\$0.5M	35,000	6,000
CPS energy efficiency goals	Achieve 2020 demand reduction potential of the "aggressive incentive scenario" in Nexant's study	250,000	15,000	\$20M	5,500 jobs; local and non-local	Uncertain	150,000	25,000
Task Force on Sustainable Buildings, 15% energy reduction mandate by 2010	Benefits calculated for 2015, the 5 <sup>th</sup> year of the new codes	250,000	15,000	\$20M	--	--	150,000	25,000
Task Force on Sustainable Buildings, 30% energy reduction goal	Benefits calculated for 5 <sup>th</sup> year of achieving 30% energy reductions	450,000	35,000	\$35M	--	--	300,000	50,000

# CPS Energy: Overstating the Cost of Energy Efficiency

- First... the CPS Goal and Costs:
  - 771 MW (\$850 million total) in 12 years
  - 69 MW/yr starting in 2012 at \$75 million/yr
    - (CPS slide 6 of STEP ppt 5-14-2009)
  - Projected Cost: \$1102/kW
- But experience shows efficiency is not that pricey
  - Texas average cost: \$200-400/kW
    - (Texas PUC "Itron" Report, 2008)
  - Austin average cost: \$350/kW
  - CPS Experience: \$276/kW
    - Spent \$11.5 million to save 40 MW
- 771 MW should cost closer to \$270-385 million
- Assuming more aggressive DSM costs rise from \$350/kW to \$500/kW for total average cost.

On a dollar/kW basis, Energy Efficiency beats investment in Nuclear no matter what cost estimate is used.



## STEP+

### 1,000 MW by 2020 of Energy Efficiency

- Oct. 2009 B Session presentation showed potential of **1,332 MW** total peak reduction by 2020.
- Rifkin report: Calls for additional 220 MW beyond STEP to get to approximately 1,000 MW.
- Rifkin report estimates \$2622/kW, though others (Austin Energy) have estimated that more aggressive efficiency costs closer to \$500/kW.
- Even assuming high Rifkin numbers, he states that 1,000 MW of EE has average cost of \$1425/kW vs. nuke estimate of \$4814/kW.
- The Green Plan assumes a midpoint of \$350 million for extra 220 MW of energy efficiency (\$1590/kW).

# Other Factors: New Construction

- Future energy codes with enforcement (Mission Verde)
  - 2010 Codes: 30 MW 2010-2015
  - 2015 Codes: 50 MW 2016-2020
- Green Building standards
  - “Zero-Energy” homebuilding by 2015 (homes that produce as much energy as they consume over one year)
  - Combination of green building and retrofits should keep demand flat in residential sector once “zero-energy” homes are standard

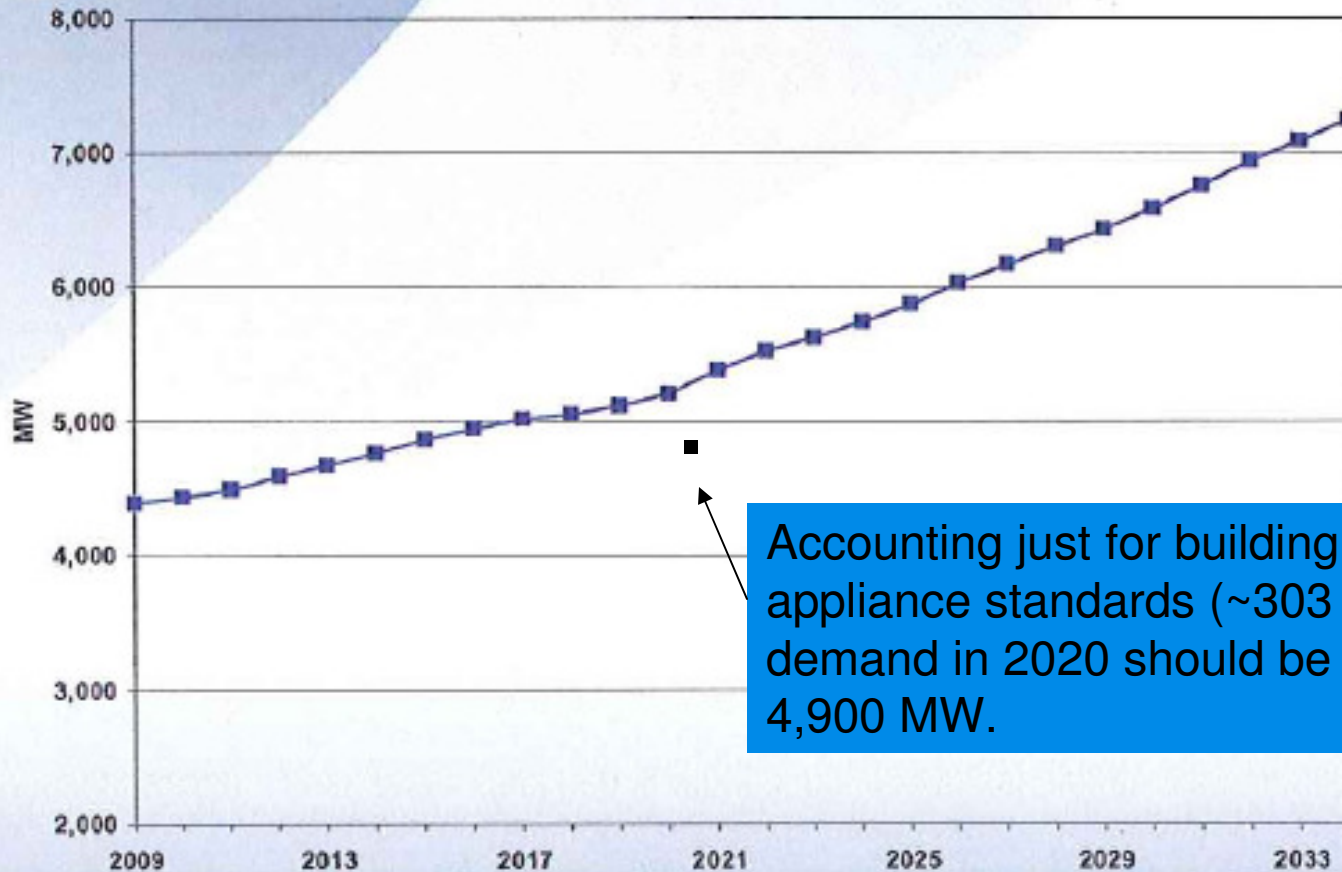


# Other factors lowering future demand: New Appliance Standards

- New federal appliance standards on dozens of appliances will lower demand. This is currently unaccounted for in demand forecasts from CPS.
  - Residential: Central AC, room AC, clothes washers, et al
  - Commercial: Reach-in & walk-in refrigerators/freezers, beverage vending machines, boilers, et al
  - See Texas-specific data [here](http://www.standardsasap.org/state/2009%20federal%20analysis/states/fedappl_tx.pdf):
    - [http://www.standardsasap.org/state/2009%20federal%20analysis/states/fedappl\\_tx.pdf](http://www.standardsasap.org/state/2009%20federal%20analysis/states/fedappl_tx.pdf)
- Statewide MW savings from new appliance standards are estimated to be 3187 MW by 2020.
- If San Antonio represents 7% of total Texas peak load, this represents approximately **223 MW** of demand savings for San Antonio in 2020.
- Present analysis assumes no demand savings from new appliance standards, but there will be savings.



## Peak Demand Forecast (MW)



Note: Save for Tomorrow Energy Plan (STEP) is included.

Assumptions for 2009 Resource Plan Analysis - Public Version - June 29, 2009

7

# Other Factors: Mechanisms and Strategy

- 1937/Loans
  - Energy districts whereby a city may issue bonds to finance energy efficiency retrofits or onsite renewable energy systems and recover capital through voluntary assessment on property
  - Helpful to middle-income residents, businesses
- Keep weatherization qualification at 200% above poverty
  - After ARRA weatherization funds are spent
  - Helpful to low-mid income
- Education and Outreach:
  - Proactive approach improves program participation
  - Pleasantville weatherization project:
    - Neighborhood door-to-door
    - 15% energy savings; \$1000 per home

**Experience thus far has shown CPS savings goals have been surpassed.**

# Combined Heat & Power/Co-Gen: 75 MW available for \$180 million

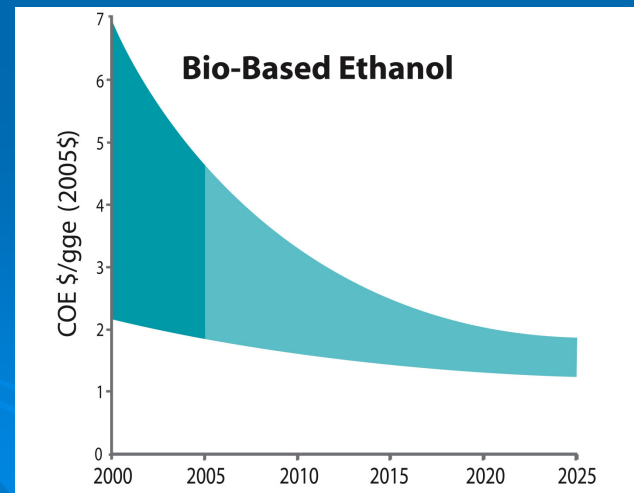
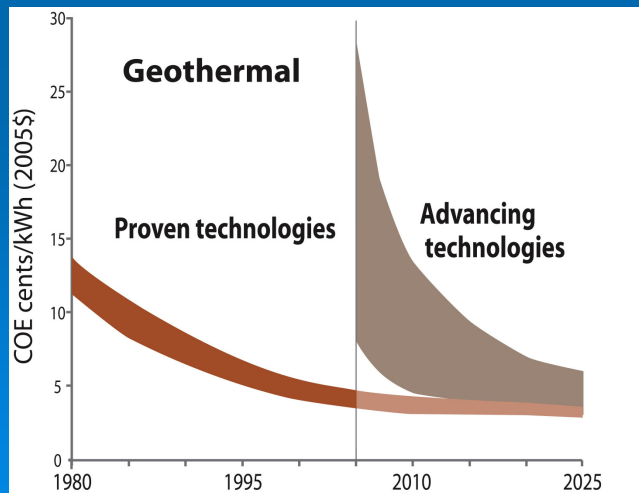
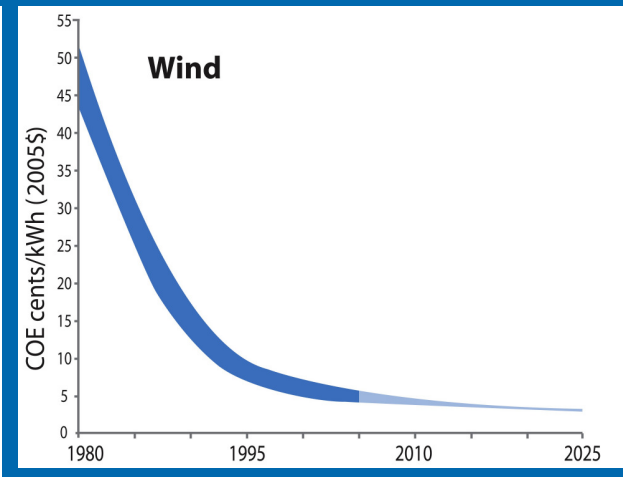
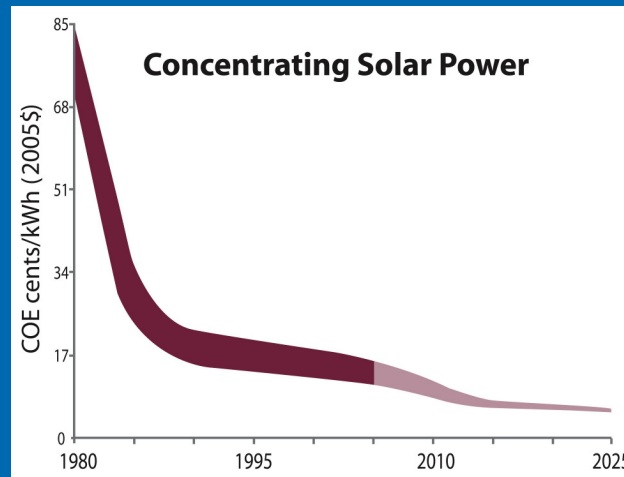
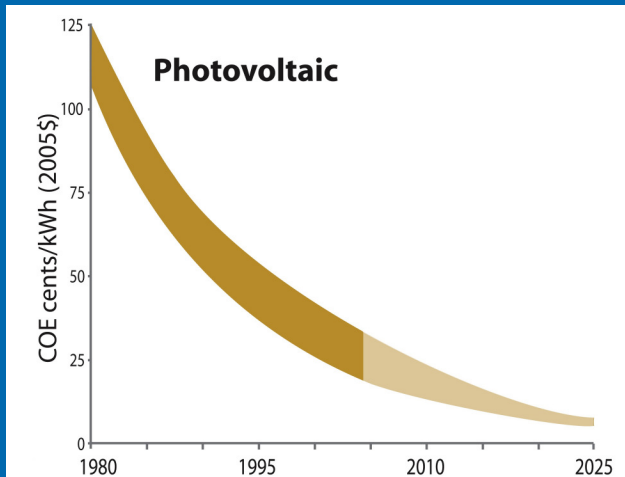
- Recent 2008 study found Texas leads the nation in the use of CHP, with an estimated 135 facilities currently operating CHP systems capable of producing 17,333 MW of power;
- Potential for an additional 13,400 MW of economical CHP by 2023 in state, including more than 5,000 MW in medium-sized facilities (1 to 10 MW).
- Capital costs are \$1,000 to \$5,000/kW, with a whole variety of different technologies, but operating costs are low because of heat recovery and high efficiency;
- For most systems around \$2,500/kW for Gas Turbine system;
- In San Antonio, dozens of small and medium commercial, industrial and institutional buildings might benefit from 1 to 25 MW systems.
- Analysis found approximately 150 MW of combined heat and power projects possible in San Antonio -- analysis assumes half can be realized in next 10 years.
- Analysis and financing options must be studied for public and private entities.

# Renewable Energy



# Renewable Energy Cost Trends

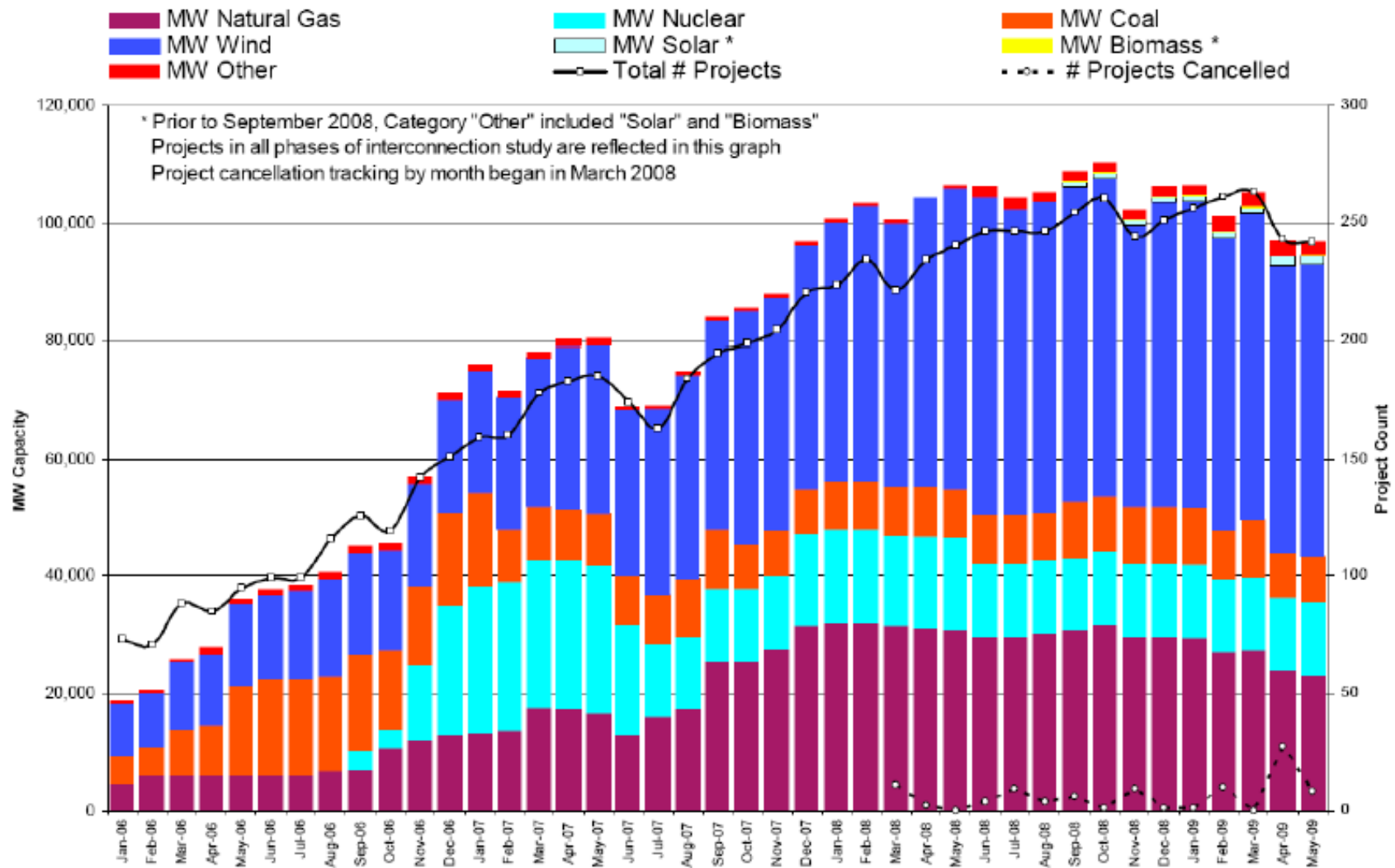
Levelized cost of energy in constant 2005\$<sup>1</sup>



Source: NREL Energy Analysis Office ([www.nrel.gov/analysis/docs/cost\\_curves\\_2005.ppt](http://www.nrel.gov/analysis/docs/cost_curves_2005.ppt))

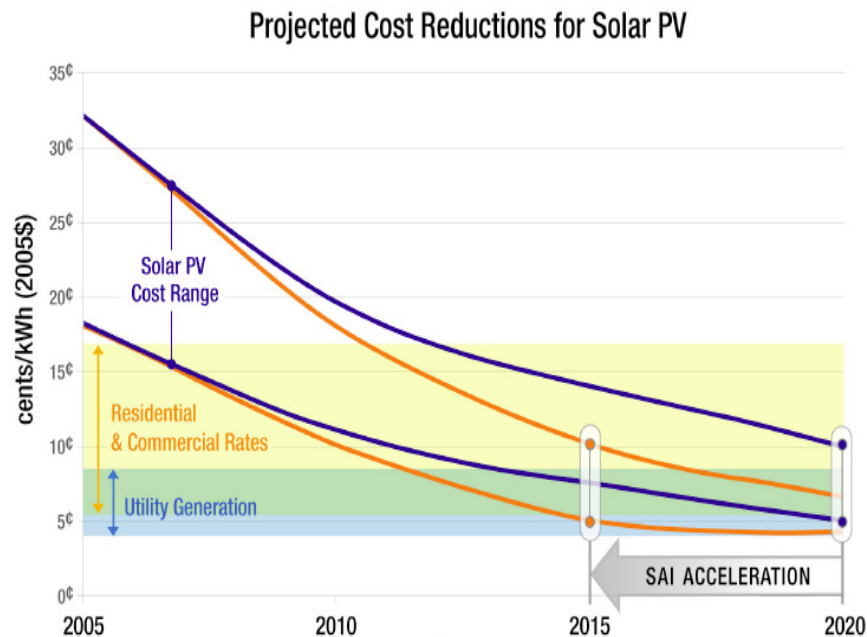
<sup>1</sup>These graphs are reflections of historical cost trends NOT precise annual historical data. DRAFT November 2005

# History of ERCOT Interconnection Requests by Technology Type



Source: ERCOT, System Planning Division, Monthly Status Report to Reliability and Operations Subcommittee, May 2009  
[http://www.ercot.com/content/meetings/ros/keydocs/2009/0611/07\\_May\\_2009\\_System\\_Planning\\_Report\\_to\\_ROS\\_-\\_final.pdf](http://www.ercot.com/content/meetings/ros/keydocs/2009/0611/07_May_2009_System_Planning_Report_to_ROS_-_final.pdf)

# PV Solar Costs Going Down and Installations going up



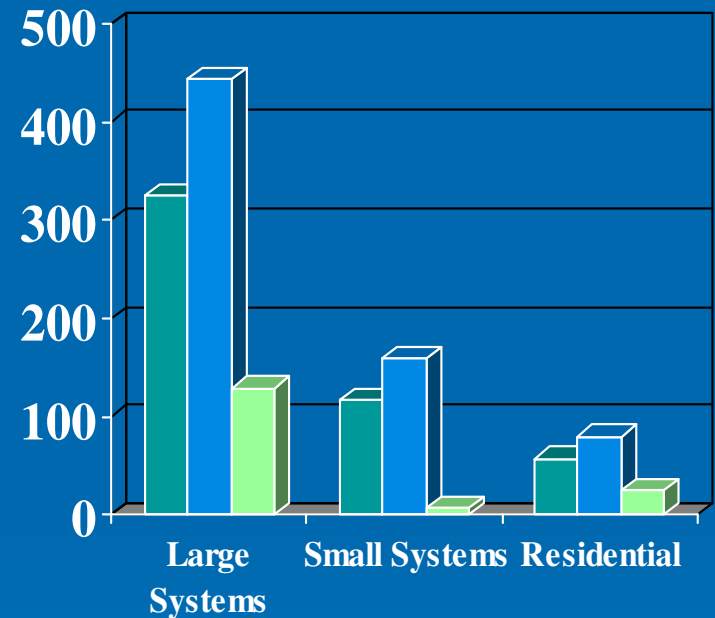
Source: The President's Solar America Initiative, Kimbis. 8/2/2006

- Berkeley Nat. Lab sampled 75% of PV systems & found average U.S. installed cost declined \$10.50/watt to \$7.60/watt in 2007\$, and even more in Germany (\$6.60/watt) and Japan (\$5.90/watt);
- In total, more than 500 MW of PV solar installed in U.S. (fourth in world), and majority in 2006 and 2007;
- Increased installations occurring even as local and state incentives decreased over time.
- Variety of mechanisms to promote on-site solar, but incentives can be reduced without affecting production.



# What Could You do with \$2.6 Billion? 250 MW of On-Site Solar Program for \$210 Million

- City Council has already committed to 250 MW of On-site Solar by 2020 through Mission Verde
- Jigar Shah of SunEdison has conducted an on-site solar program analysis designed to reach 500 MW of capacity of commercial, institutional and residential solar;
- Based on solar rebates for residential and performance bonuses for larger systems, similar to California Solar on Roof program;
- **Flexible** -- could include utility, third-party or building owner management
- Total Cost to utility: \$210 Million through life of systems ranging from \$3 to \$20 million per year;
- Total Number of MWh by 2020: 683,000 or 3% of total San Antonio demand
- To be conservative, this analysis assumes solar rebates would need to be twice the cost of the Shah analysis.



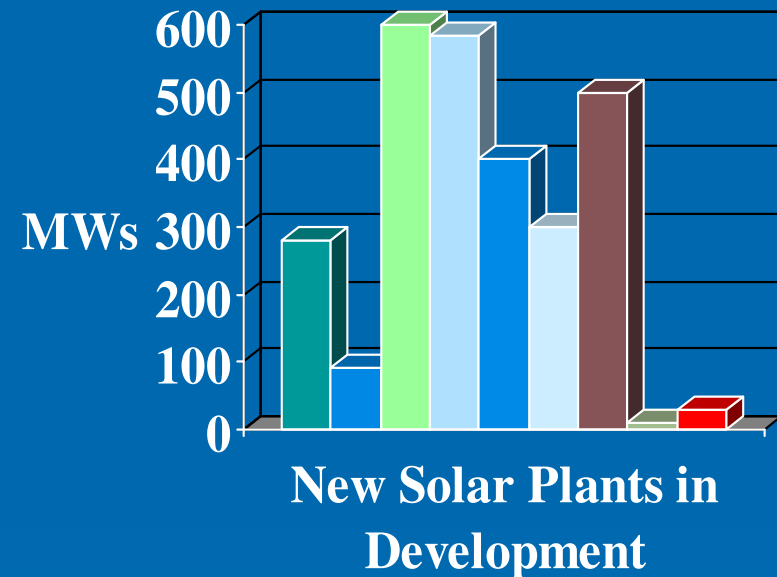
- MWs Installed
- MWhrGenerated (000s)
- Incentive Cost

Source: Jigar Shah, SunEdison CEO, 2009

# What Could You Buy?

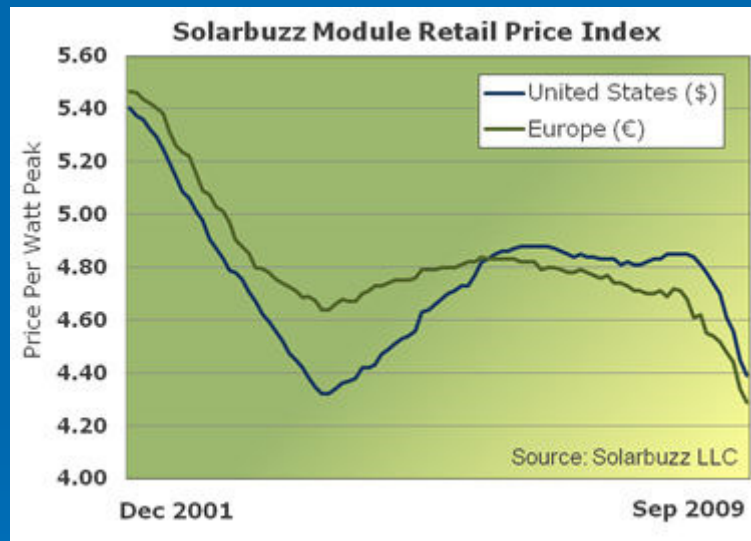
## Utility-Scale Solar: 250 MW for \$500 million

- CPS has already pursued 14 or 27 MW at high costs, using more costly technology;
- CPS should look at latest Concentrated Solar technology at larger levels;
- UT-Austin, based on the Parabolic Trough Nevada One Solar Plant of 63 MW, and other plants closing between 2006-2008, assumes a \$4,373/kW capital cost, or half what CPS assumes at \$9,000/kW;
- However, new plant data being developed in 2009 indicates that the real cost has already come down for new plants, and may be half of the Nevada One estimate;
- New plants also being developed that would merge solar with storage and gas plant to run when sun doesn't shine;
- Instead of a levelized cost of 21 cents/kWh, as CPS assumes, new solar plants will come in at half the cost, competitive with nuclear, advanced coal and natural gas.
- Recent agreement of City of Houston with NRG will cost 8.5 cents/kWh the first year by combining solar PV utility-scale with natural gas plant, or about half the Austin Energy deal for 30 MWs of Solar PV.
- Estimate for 250 MW of solar with storage at 2010 prices: \$500 million-\$1 billion depending on average cost per kilowatt of \$2500-\$4250/kW
- Lower levelized cost if solar can be hybridized with natural gas or other types of storage added.



- Abengoa, AZ
- Next Era, CA
- Bright Source, CA
- Fort Irwin, CA
- Austin Energy
- NRG, NM
- Solel, CA
- Solar Energy, TX
- Houston, NRG

# Evidence is Clear: Solar Prices Dropping



- **Not "Sunny Day" Power Plants.** The solar thermal/natural gas plant is NOT a "variable" power resource the utilities cannot predict.
- Ausra CEO Bob Fishman predicted at the 2009 Boston Going Green conference that combination design could lower total generation costs to around **7 to 8 cents per kWh**. If built without the natural gas turbine, total generation costs rise to **12 to 13 cents/kWh**.
- Utility Solar Assessment Study by Clean Edge projects that PV will reach cost parity with conventional retail electricity pricing, on a straight kWh rate basis, throughout much of the U.S. by 2015.

<http://www.cleandge.com/reports>

# What could you do with \$2.6 billion?

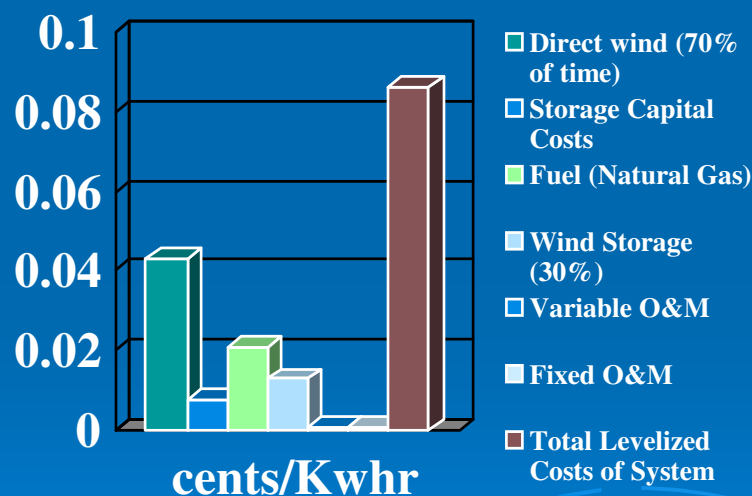
## How about 250 MW of wind for \$500 million

- While wind technology is always improving, current estimates of overnight costs suggest that \$500 million could “buy you” 250 MW capacity of 165 turbines of 1.5 MW each.
- Actual performance would depend upon wind conditions, but at 30% capacity would mean 75 MW of firm yield.
- New transmission lines with new power available in 2013;
- Combining coastal with West Texas wind provides flexible power at much lower cost than new nuclear and better meets actual energy use patterns;
- Current CPS-contracted Kenedy County wind farm just announced proposed doubling in size.

# What about adding wind storage? \$230 million for 100 MW of wind turbines plus storage

- CPS could add Compressed Air Energy Storage (CAES) to future wind farms;
- Makes wind dispatchable (when needed)
- Assuming overnight costs of \$675/kW for storage and \$1,975/kW for wind, \$32 million in overnight storage costs, plus \$200 million in overnight costs for 100 MW of wind turbines, make wind run when you need it most
- CAES system being developed by Luminant and Shell Energy in Texas and PG & E in California
- Example at right uses levelized cost estimates based upon using CAES 30% of time to release stored energy, increasing capacity from roughly 30 to 45 percent.

## Estimated Levelized Cost of Delivering Wind + Storage Energy



Original Cost Source for CAES: Dan Rastler, New Demand for Energy Storage, Electric Perspectives. (September/October 2008) p. 30-47.

## Untapped resource in Texas: Geothermal \$200 million for 50 MW

- Various studies find geothermal utility-scale resources are available in Texas, with estimates ranging from 2,000 to 20,000 MW;
- States like Utah and California have already developed geothermal;
- Geothermal has highest capacity factor of any renewable energy source since it does not depend on sun, wind or rain
- Assuming capital costs of \$5,000 per kilowatt, a \$200 million investment would “buy” 50 MW of baseload utility-scale geothermal.

# Another Renewable: Biomass

## 50 MW plant for \$140 million

- In 2008, Austin Energy signed a 20-year agreement to purchase 100 MW of capacity of biomass energy from Nacogdoches plant
- Biomass is baseload power (85% capacity)
- Biomass overnight construction costs assumed to be \$2,800 per kilowatt based on recent history
- Assumed cost of electricity delivery is 7-8 cents per kilowatt hour (Note: CPS Energy assumes 10 cents per kilowatt hour).

# Natural Gas Options





# What about natural gas?

- Combined cycle natural gas plants are efficient, have half the emissions of coal plants and can be cycled up and down as needed;
- Overnight cost estimated at \$800/kW, a fraction of what a nuclear plant costs;
- Ultimate cost is largely dependent upon fuel price, but by hedging contracts and taking advantage of recent natural gas discoveries, CPS Energy could build an additional 100 MW Combined Cycle Plant;
- 100 MW plant would cost \$80 million.

# A different approach: CPS vs. Austin Energy

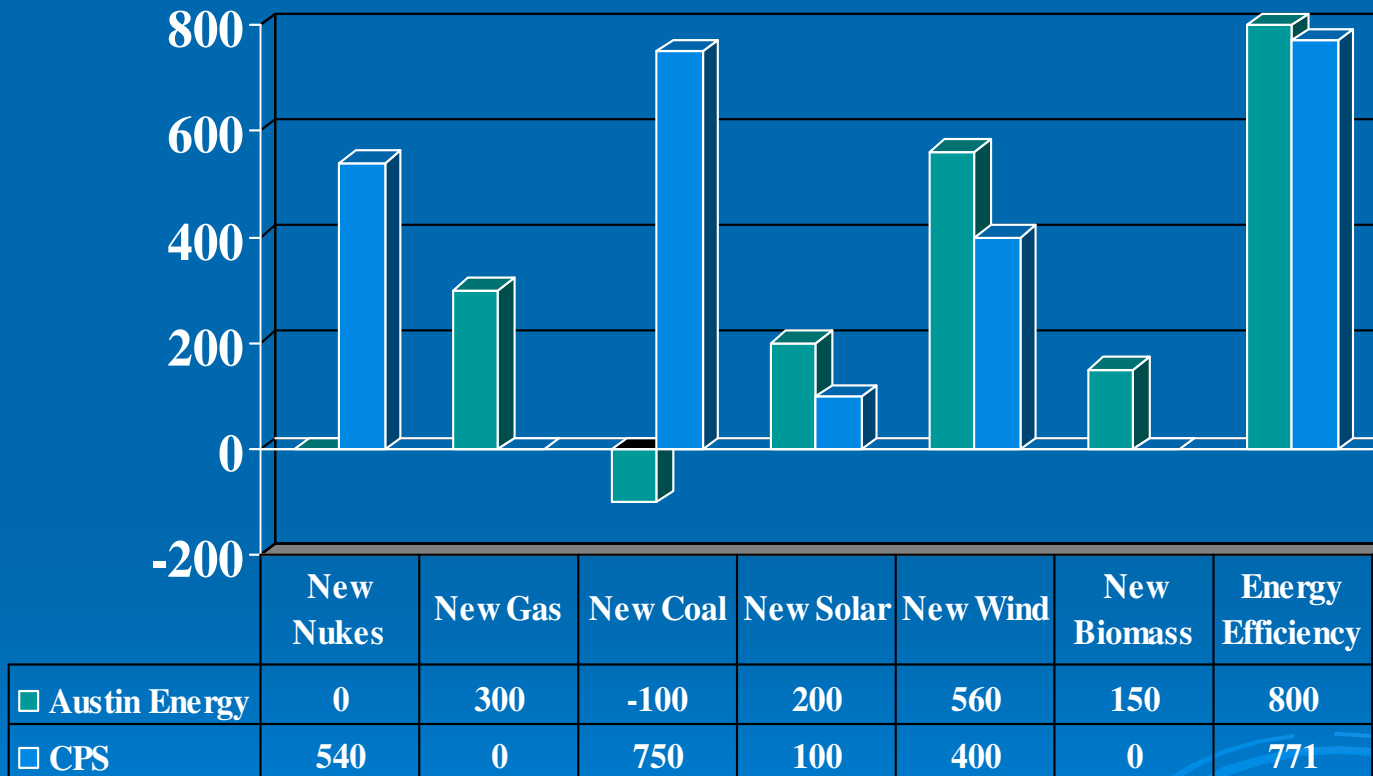
## Austin Energy Plan

- Exceed council goals of 30% (now 35%) of electricity from renewables and 700 MW (now 800) of energy efficiency by 2020;
- All options, including nuclear power, considered;
- Nine-member Task Force to offer recommendations on Austin Energy plan as well as two city council commissions;
- UT-Austin provided own model and analysis of scenarios to inform AE;
- Independent consultant, PACE, ran 12 scenarios developed by stakeholders as well as risk analysis on six scenarios;
- Task force screened two additional scenarios;
- Austin Energy plan also screened and analyzed for risk
- 15 Scenarios Run in All.
- **Nuke option considered most risky**

## CPS Plan

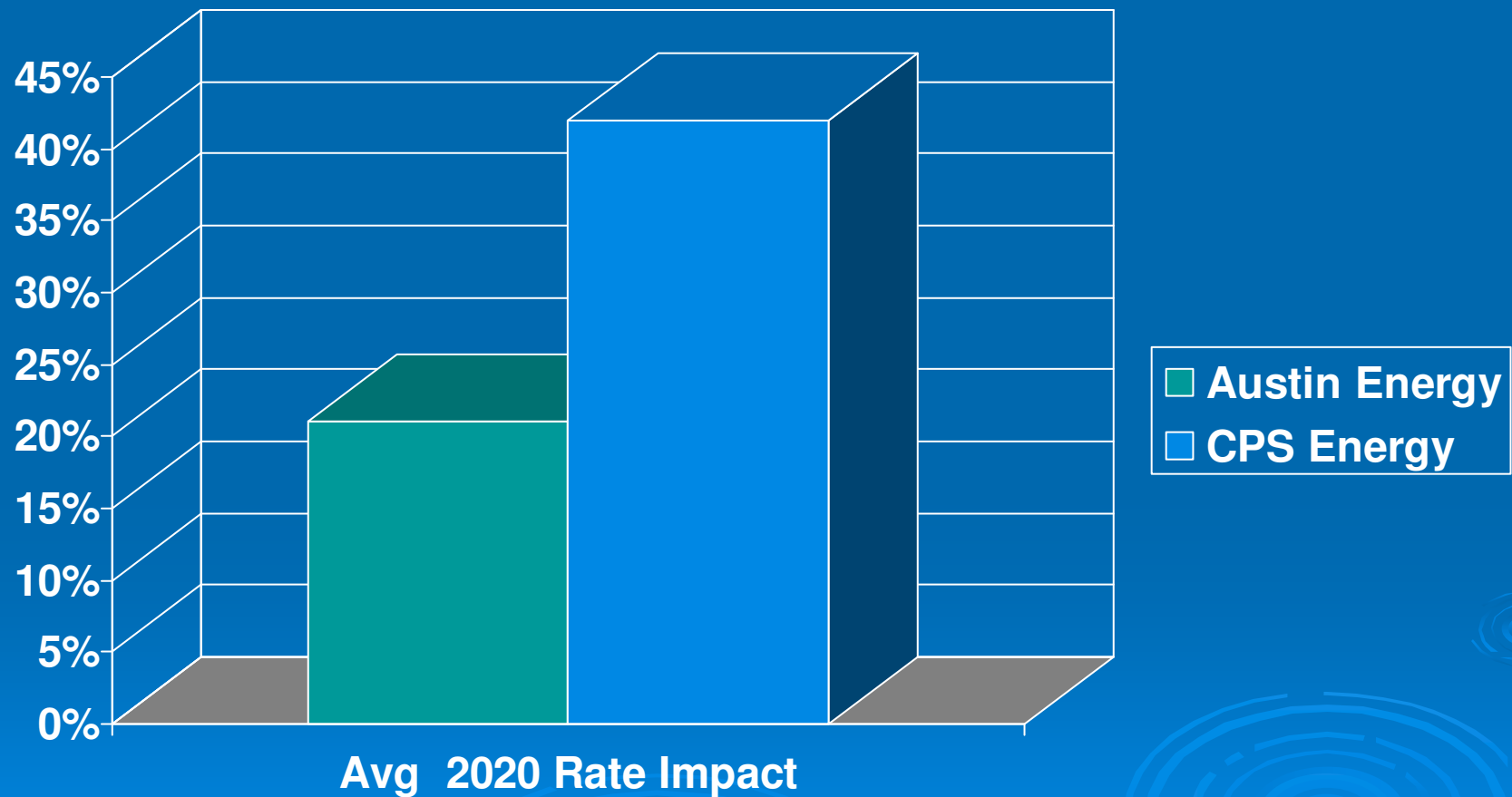
- Meet goal of 20% of peak demand from renewables and STEP energy efficiency goals;
- CPS has approached issue as yes or no on the nuclear, with natural gas the only other option
- No citizen/council task force on entire plan, though several disparate groups have been consulted
- City hired consultant but no independent scenarios run
- A number of additional efficiency and renewable studies, but no centralized process.

# San Antonio vs. Austin Draft Energy Plans: New Resource Additions in MW

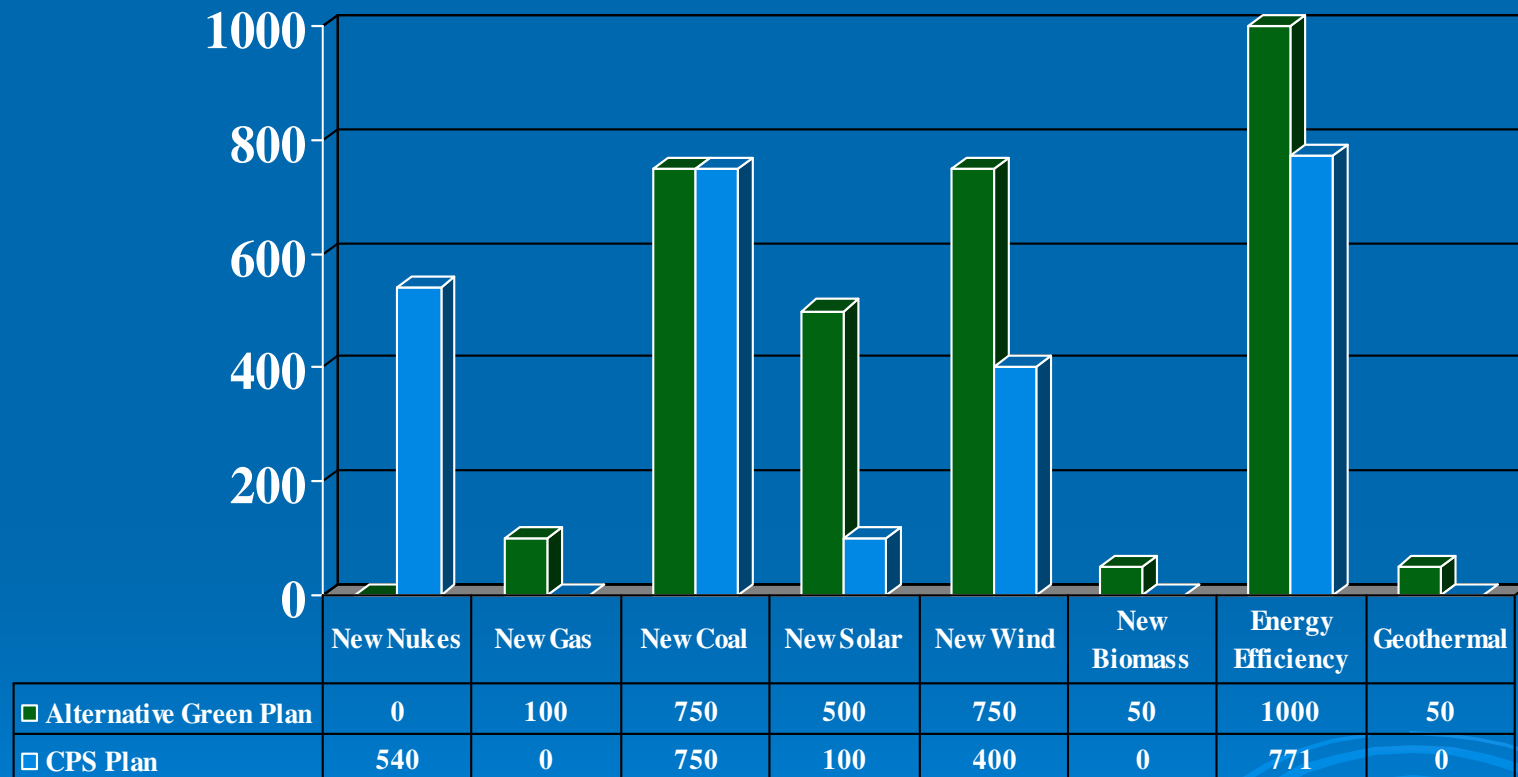


■ Austin Energy □ CPS

# Estimated Residential Rate Impact in 2020



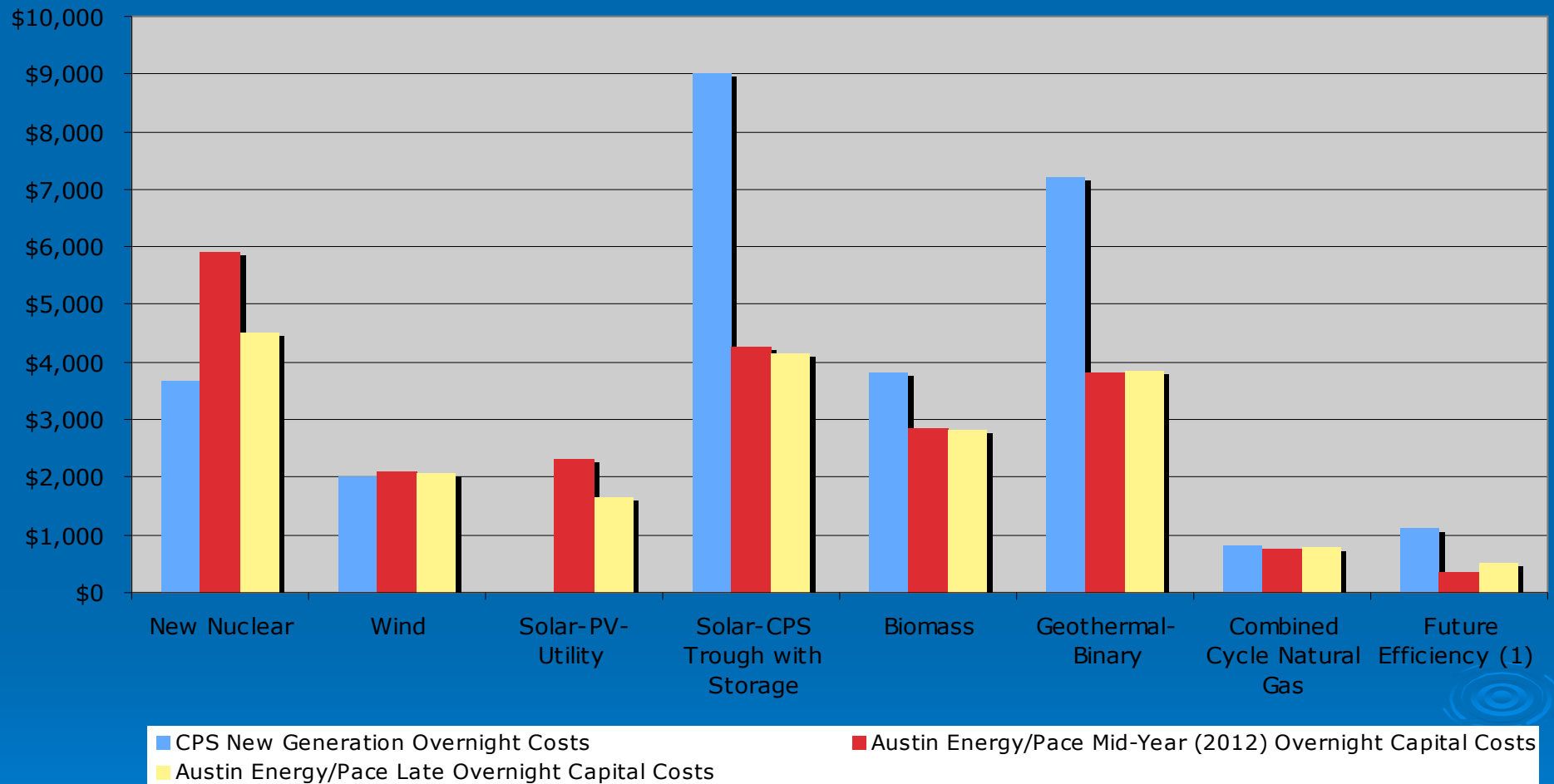
# A New, Flexible, Less Risky Greener Plan for San Antonio: 1,000 MW EE, 1,350 MW Renewables, 100 MWs Gas



■ Alternative Green Plan □ CPS Plan

\*Green plan includes new coal because it assumes Spruce 2 will run.

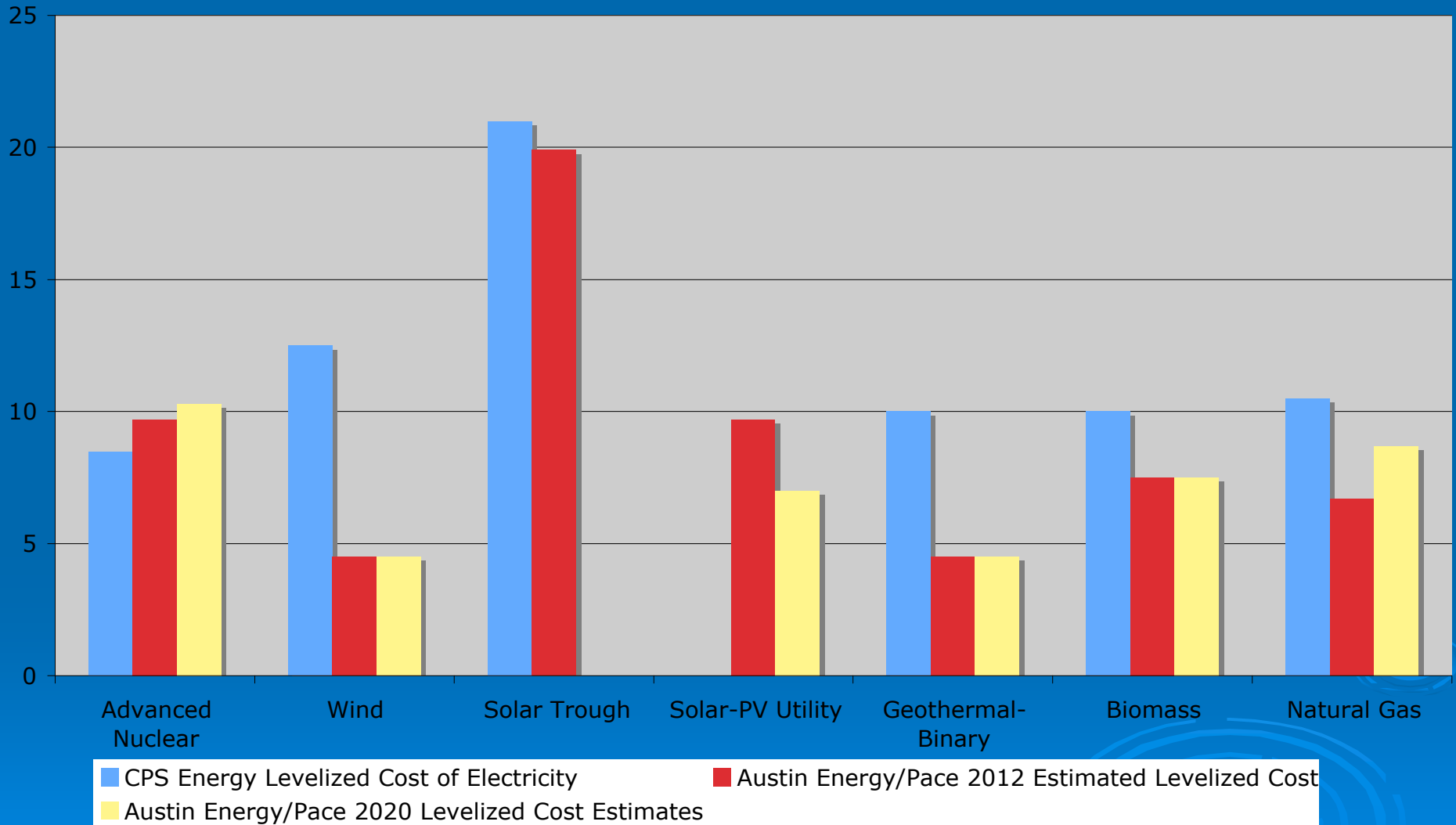
## Comparison between average overnight cost in \$s per Kilowatt for different energy technologies between CPS Energy and Austin (as Modeled by Pace)



Note: (1) Efficiency for Austin Energy is assumed to be \$350/kW in early years and range between \$350 and \$750 per kW in later years depending on program. Source: CPS Energy, Resource Chart, and Pace, Assumptions and Market Drivers Document, July 15, 2009.

Note: CPS provides no estimates for PV solar utility-scaled power even though they have recently contracted for PV Solar Power

## Difference Between Average Levelized Cost Between CPS Energy and Austin Energy, as Modeled by Pace in Cents per Kilowatt Hour

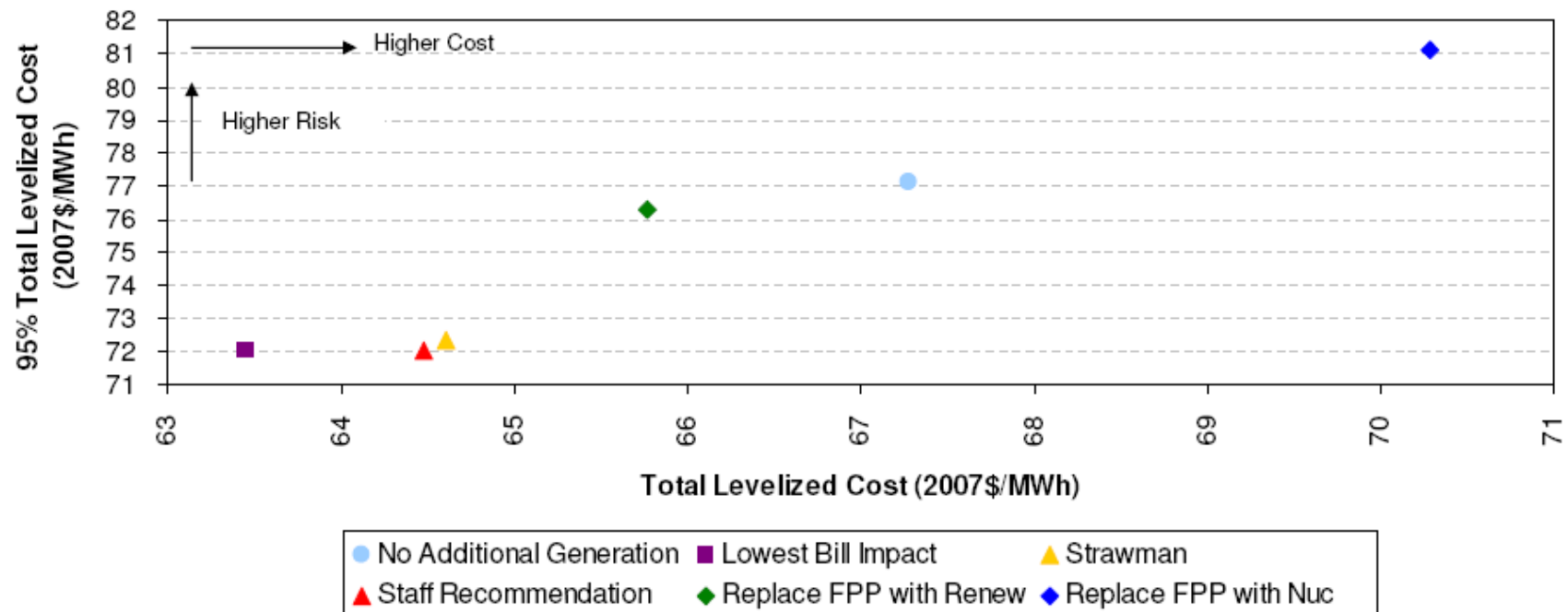


Source: Pace, Levelized Cost Comparison, October 2009 and CPS Energy, Generation Technology Comparison, August 20

Note: CPS provides no estimates for PV solar utility-scale power even though they have recently signed a contract for 14 MWs of PV solar.

## Expected (mean) Value of Levelized Cost (500 iterations)

- When the costs are levelized from 2009 through 2030 (NPV averaged across time), the differences in 2020 are offset by the fact that most portfolios are similar prior to 2017
- The No Additional Generation portfolio increases in cost and risk at it becomes more exposed to the market over time





# Some Recommendations

- City Council should reject any consideration of additional upfront monies for investing in the nuclear plant;
- City Council should not be put in position of choosing between only two scenarios;
- City Council should hire a consultant to work with CPS Energy to develop a variety of scenarios, and conduct both screening and risk analysis based on cost, reliability and environmental stewardship;
- City Council should consider having a task force charged with providing an independent recommendation of different scenarios.
- **City Council should adopt an aggressive Green Energy Plan with a 30% renewable goal, an 1,000 MW of Energy Efficiency and Additional Natural Gas for Back-up and meeting peak demand.**