Climate Change Legislation and Solar's Impact on Florida's Energy Prices and Natural Gas Usage

Florida Gas Utilities

Oct. 13, 2021

Florida Highly Impacted by Aggressive Climate Legislation

Leads to Heavy Solar Use and Significant Increases in Power Costs

- Floridians use more electricity due to heat and humidity
  - Customers need affordable electricity
- Florida utilities reduced CO_2 emissions ~35% since 2005 via natural gas
- Solar is Florida's only renewable resource
  - Much less available than in California, the other "Sunshine" state
- Florida's geography limits import of out-of-state renewables
- CO_2 reduction proposals would increase power costs 100%–300%
  - Significant challenge of land availability, permitting and transmission siting

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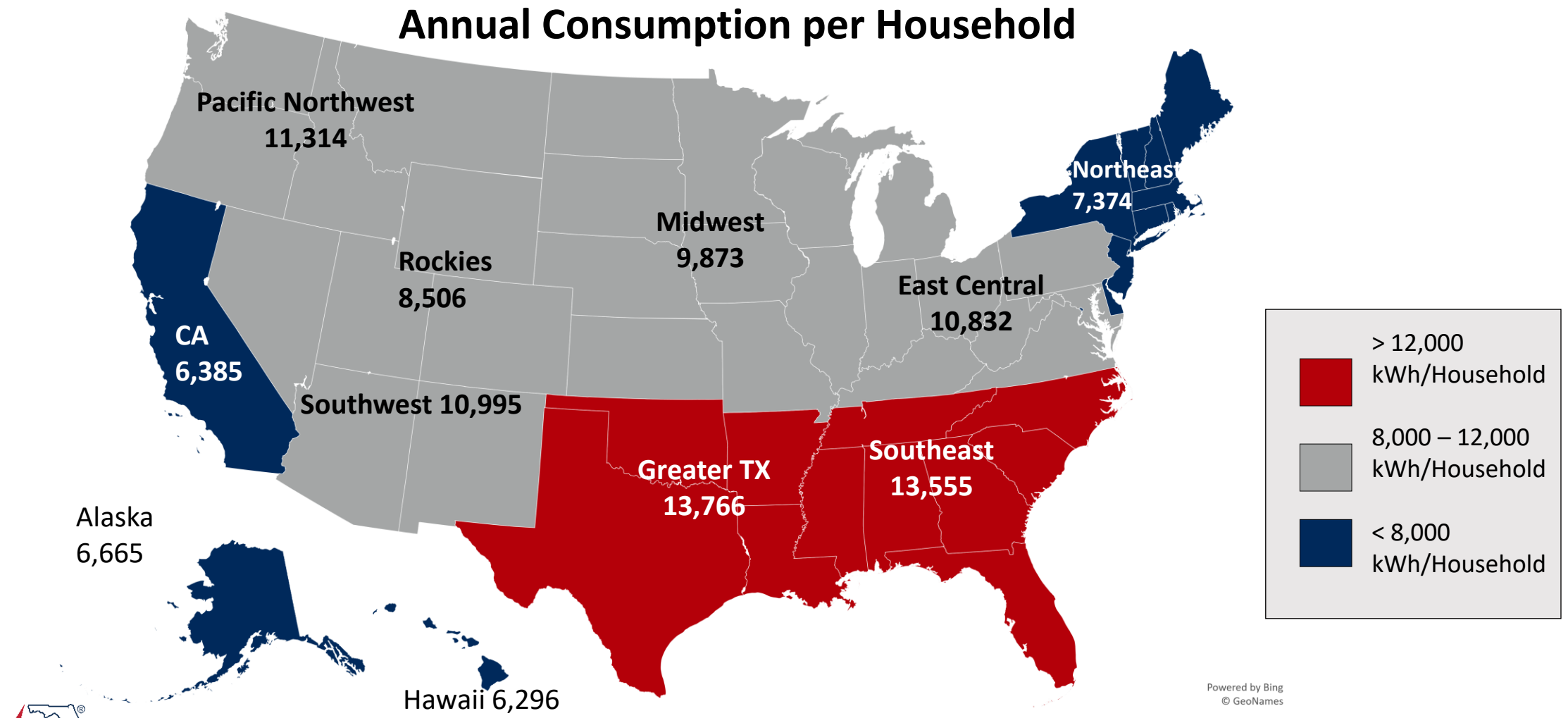
South's High Power Consumption per Home

Floridians Use Twice As Much Power as California and Northeast



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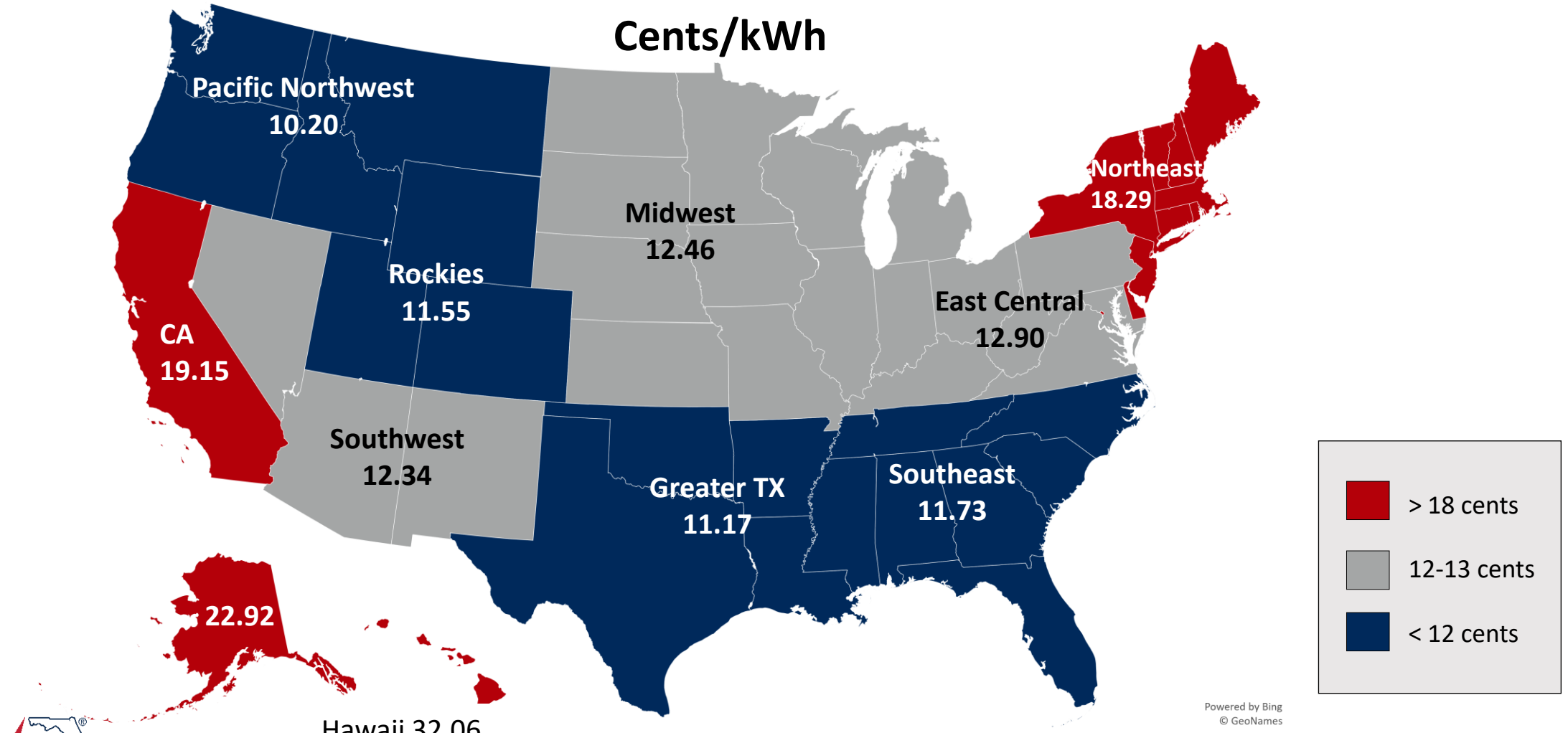
Power Prices in South Very Affordable

Higher Consumption Regions Typically Have Lower Prices



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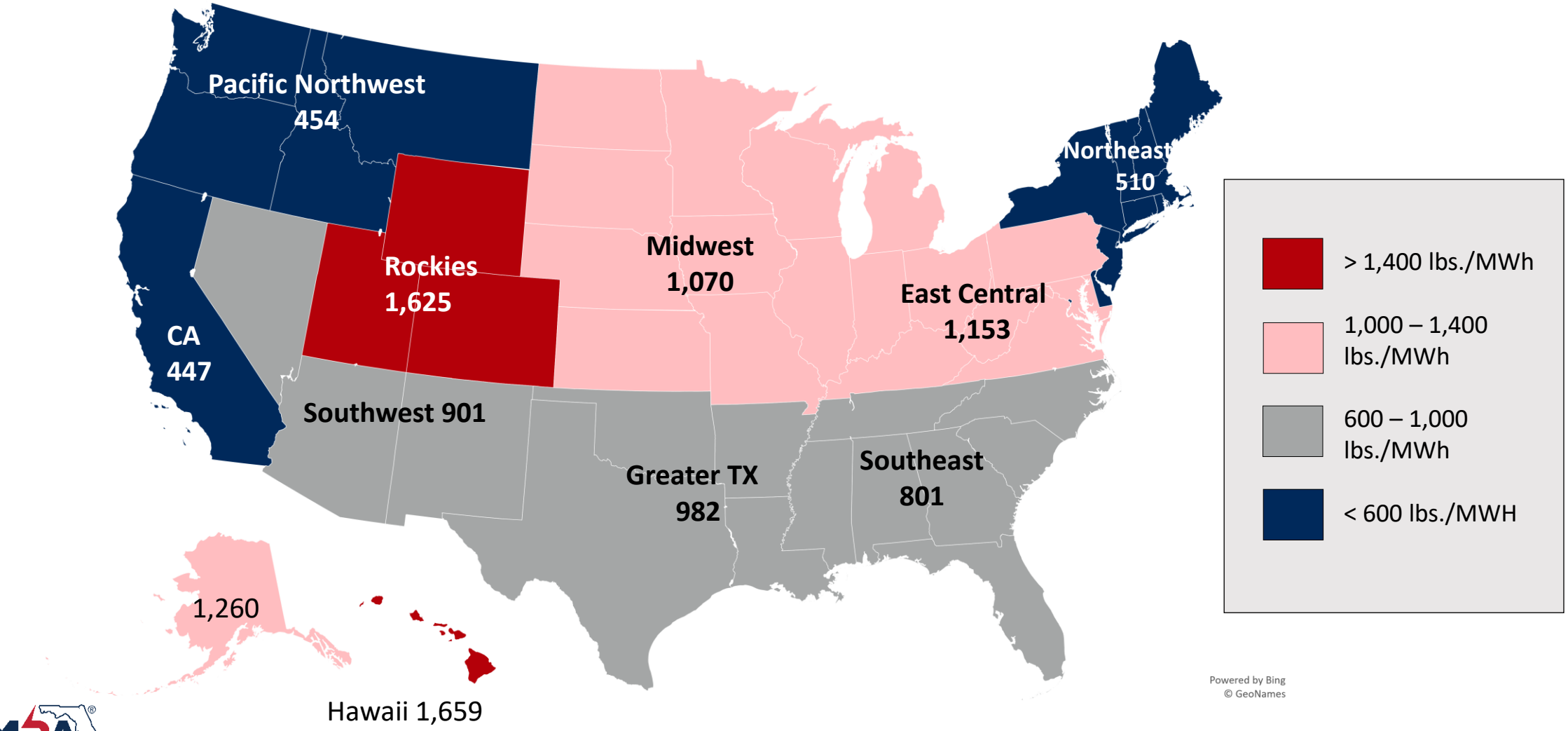
U.S. Regional Electric Generation CO_2 Emissions (lbs./MWh)

Emissions Driven in Part by Access to Natural Resources



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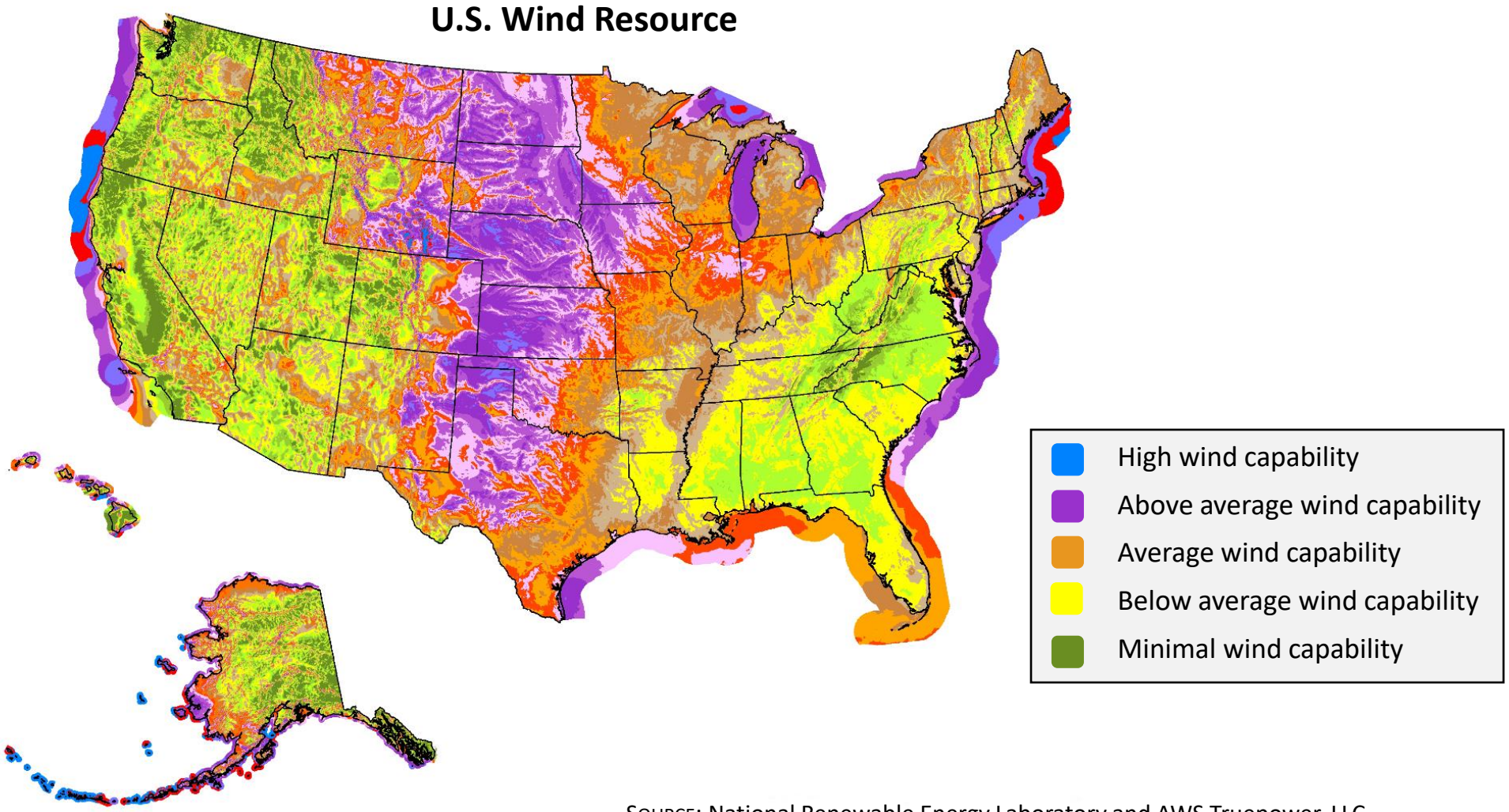
Wind Access Strong in Middle Part of United States

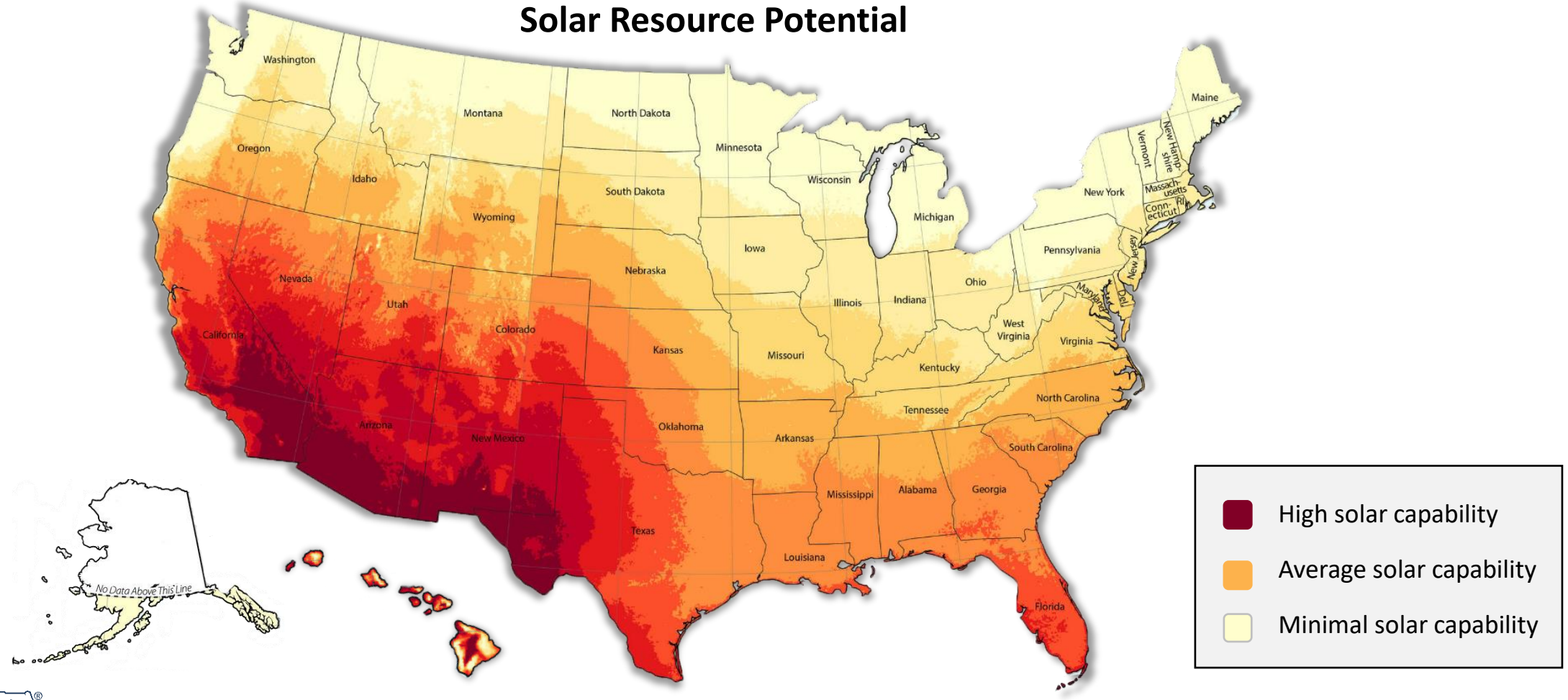
Resource Very Limited in Most Parts of Eastern U.S.



SOURCE: National Renewable Energy Laboratory and AWS Truepower, LLC

Solar Capability Predominate in Southwest

Florida Not Nearly as Sunny as Southwest, North Limited



SOURCE: National Renewable Energy Laboratory

Florida is Sunny ~68% of Time, Far Less Than AZ/CA

*Interior Florida Less Sunny - Orlando Averages 234 Sunny Days**

	Max Sunny Days	Average Sunny Days
Florida	**281**	**248**
Orlando	265*	234
California	281	263
Arizona	310	299
United States**	310	217

Orlando is (on average):

- 11% less sunny than Los Angeles, CA
- 7% less sunny than San Diego, CA
- 25% less sunny than Phoenix, AZ

Location	Sunshine Ave % Possible	Clear Days	Partly Cloudy Days	Cloudy Days
FL Average*	68	95	145	126
Jacksonville, FL	64	94	127	144
Key West, FL	77	104	155	107
Miami, FL	70	74	175	115
Pensacola, FL	60	105	123	137
Tampa, FL	69	101	143	121
Orlando, FL	64*	89	147	130
AZ Average*	82	189	93	84
Phoenix, AZ	85	211	85	70
Tucson, AZ	85	193	91	81
CA Average*	72	169	91	105
Los Angeles, CA	72	186	106	73
San Diego, CA	69	146	117	102

Source: NOAA Comparative Climate Data For the United States Through 2018

*Average of above source, http://bestplaces.net/climate/city/florida/orlando, and http://currentresults.com/weather/florida/annual-days-of-sunshine.php. Max sunny days for Orlando estimated based on FL level variance between average and max.

**Calculated from all weather stations in the source document.

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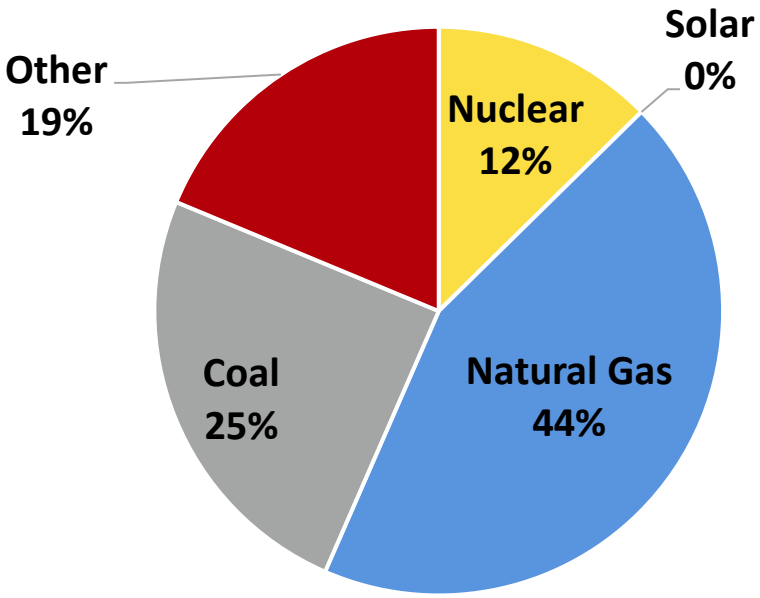
Florida Electric Mix Shifting to Natural Gas

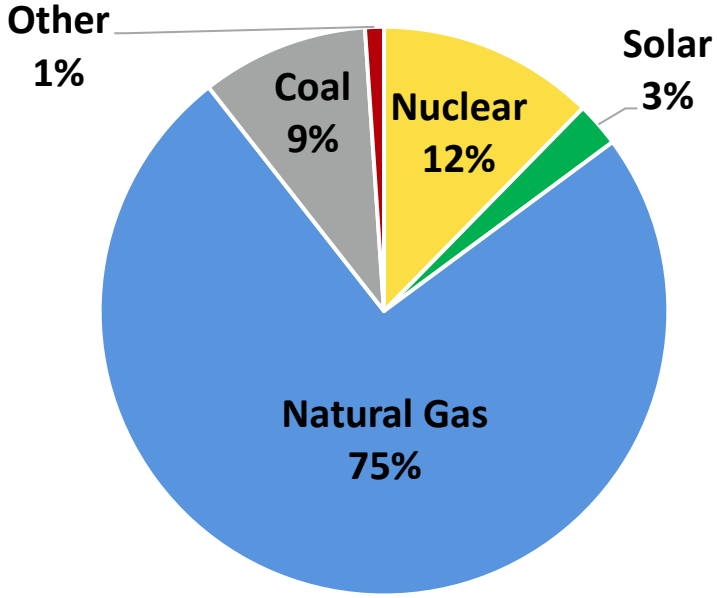
Florida Largest Percentage of Gas for Significant U.S. State

2005*



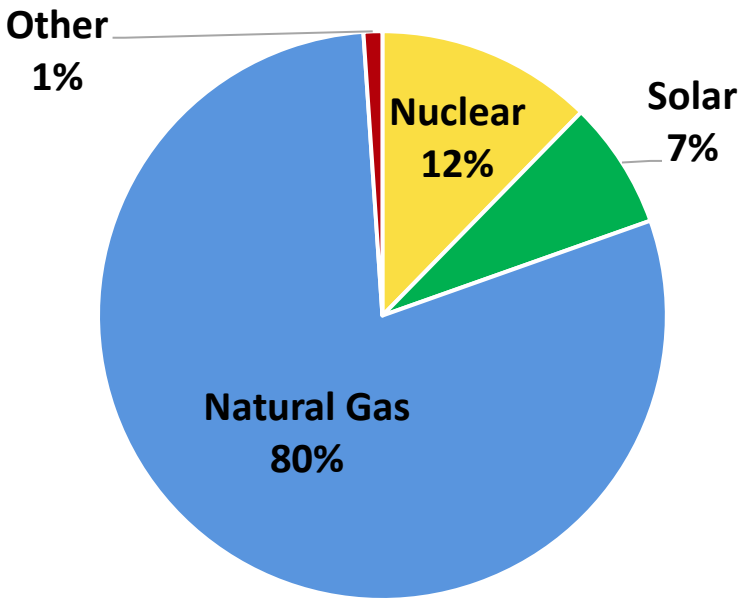
226,544 GWh

Today



238,535 GWh

2027 (Estimated)

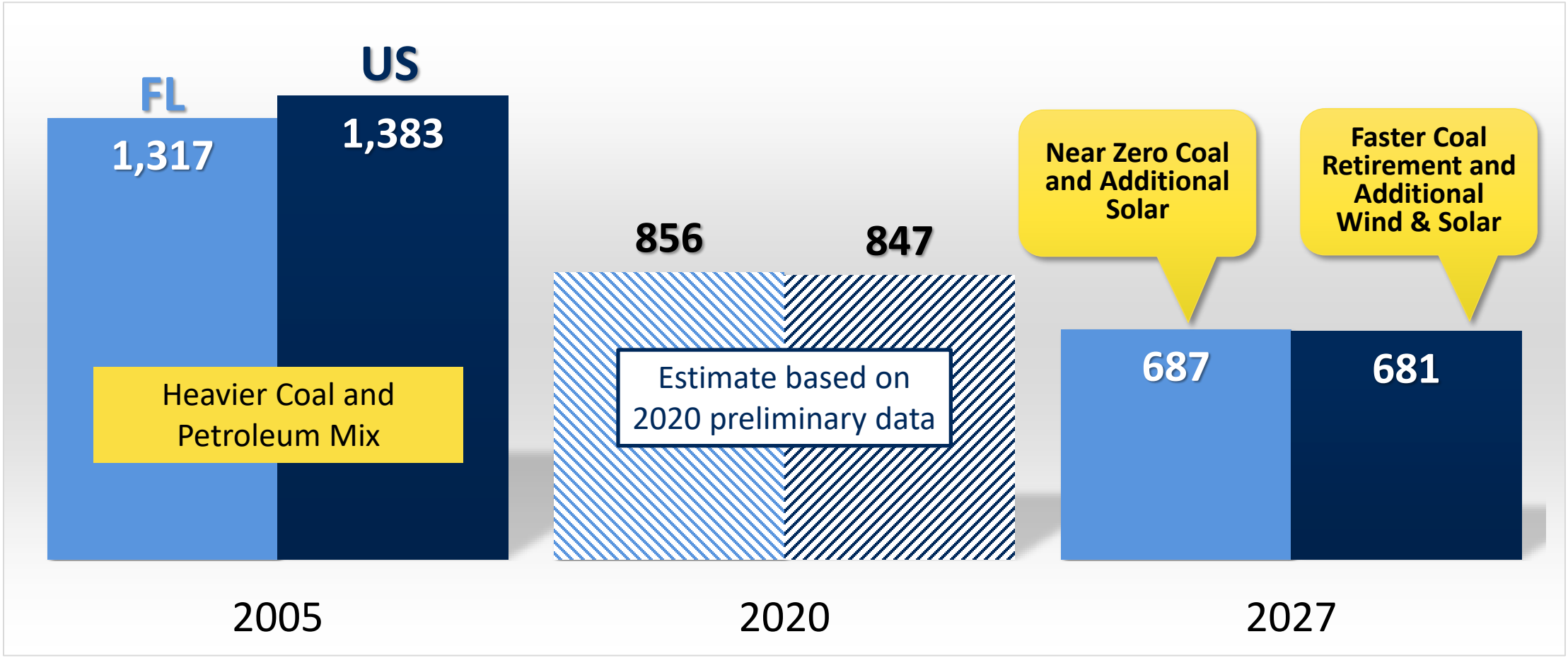


238,535 GWh

*Other includes residual and distillate fuel oil

FL Electric CO_2 Emissions Decreased 35% from 2005

~50% Decline by 2027: More Gas & Solar and Minimal Coal



Source: EIA (historical). Forecast reflects coal retirements at the same rate as prior 5 years (US) and known or announced coal retirements (FL). Includes expansion of wind and solar based on S&P Financial projections (US) and solar expansion per FL transmission interconnection queue per FRCC.

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Increasing CO_2 Reductions in Florida Comes at a Cost

Power Cost Increases Could Range from Inflationary to 300%

50%
CO_2 Reductions

Inflationary
cost increases

expected through 2027 while achieving 50% CO_2 reduction from 2005 levels

70%
CO_2 Reductions

20%
cost increases over inflation

using gas generation for reliability and peaking, solar power increases, some batteries

95%
CO_2 Reductions

50 - 100%
cost increases over inflation

with significant solar power plus battery backup with natural gas only available for emergency use

100%
CO_2 Reductions

200 - 300%
cost increases

with significant amounts of new solar plus dramatic increase in battery capacity to provide days of reserves for cloudy periods

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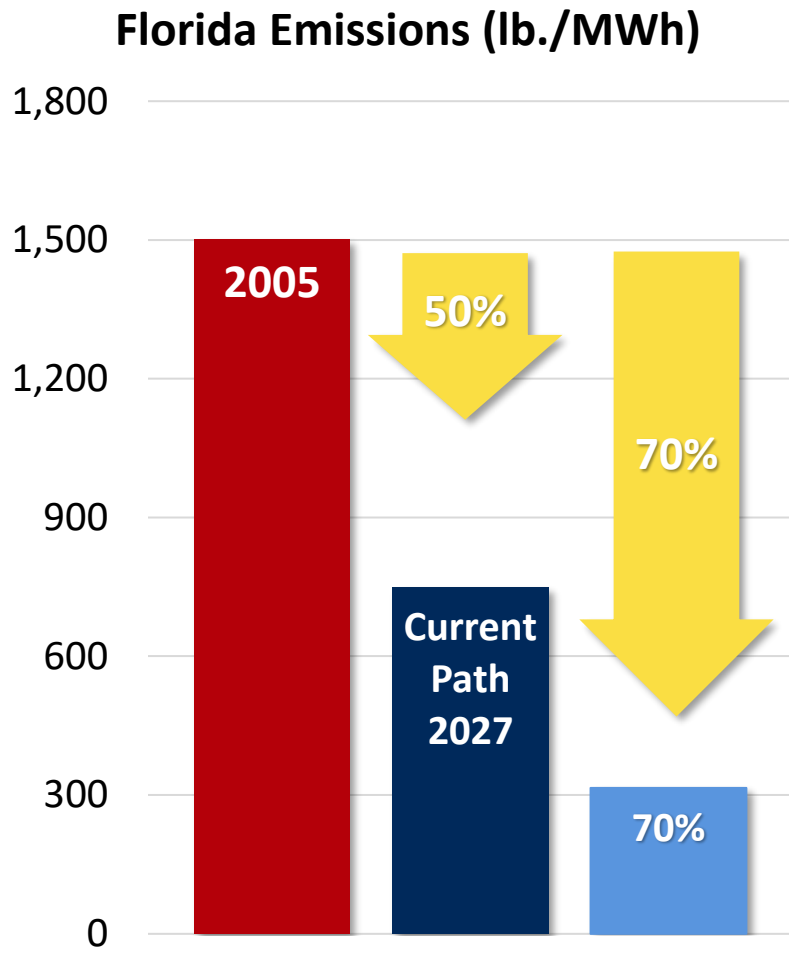
70% CO_2 Reduction – Balancing Solar with Natural Gas

Solar for Energy and Thermal Generation for Capacity & Energy

- Adding solar curbs gas generation during high sun hours of day
- Keeping low-cost, clean gas fleet has several significant benefits
  - Lower cost than adding batteries
  - Provides needed reliability and grid stabilization
- As coal and oil retires, additional gas units will be needed to meet required capacity



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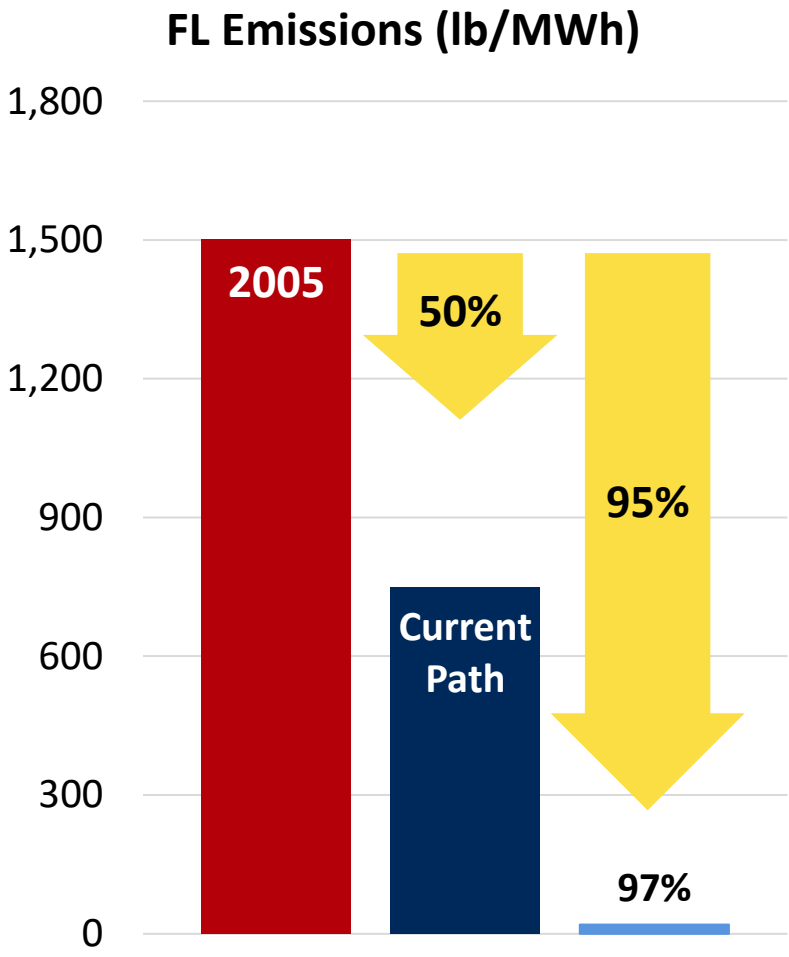
~95% CO_2 Reduction - Solar with Batteries & Natural Gas

Battery Mix Further Reduces CO_2 at Very High Cost

- Solar and Batteries are 4X current Florida system
  - Solar energy sufficient to serve load and charge battery
  - Batteries sufficient to serve load during non daylight hours
  - Gas generation serves load and charges batteries when solar energy is insufficient to meet all load
    ~ 50% of days
- Gas fleet maintained for peaking/reliability
  - Prevents reliability and stability problems when intermittent resource not available
  - Gas peaking units lower cost than more batteries



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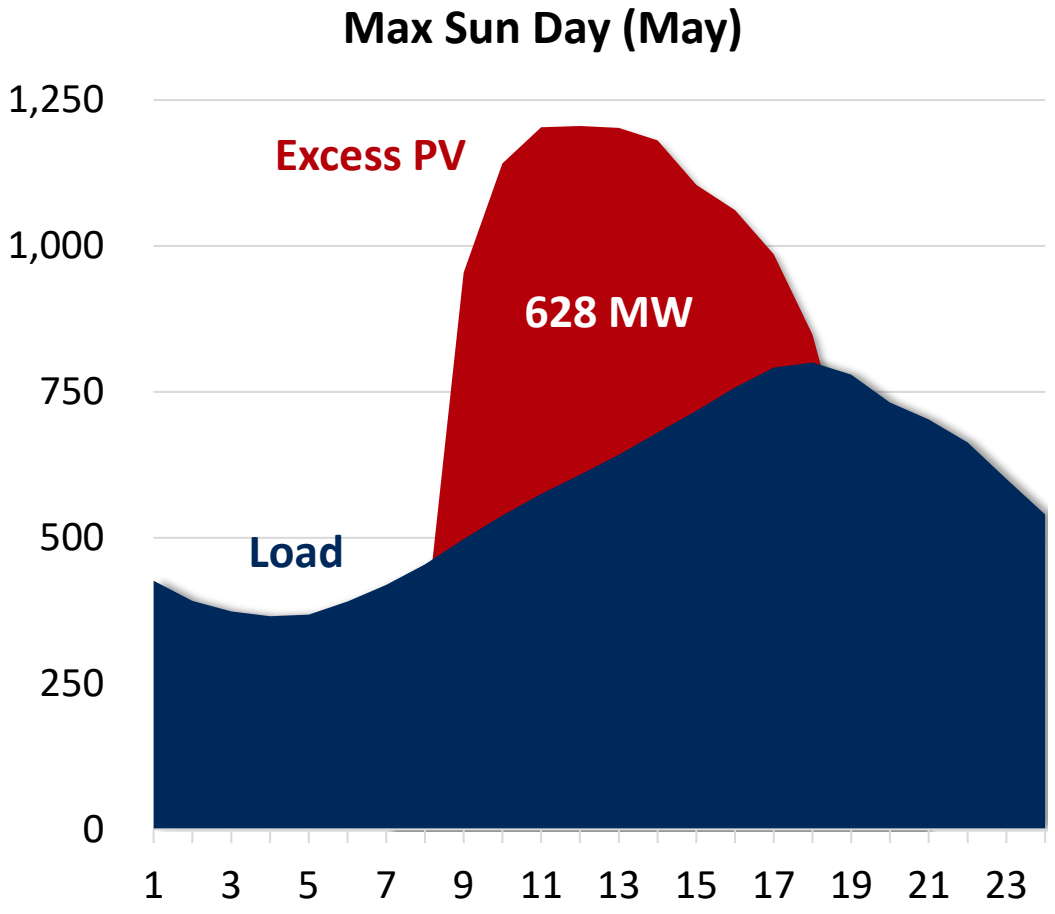
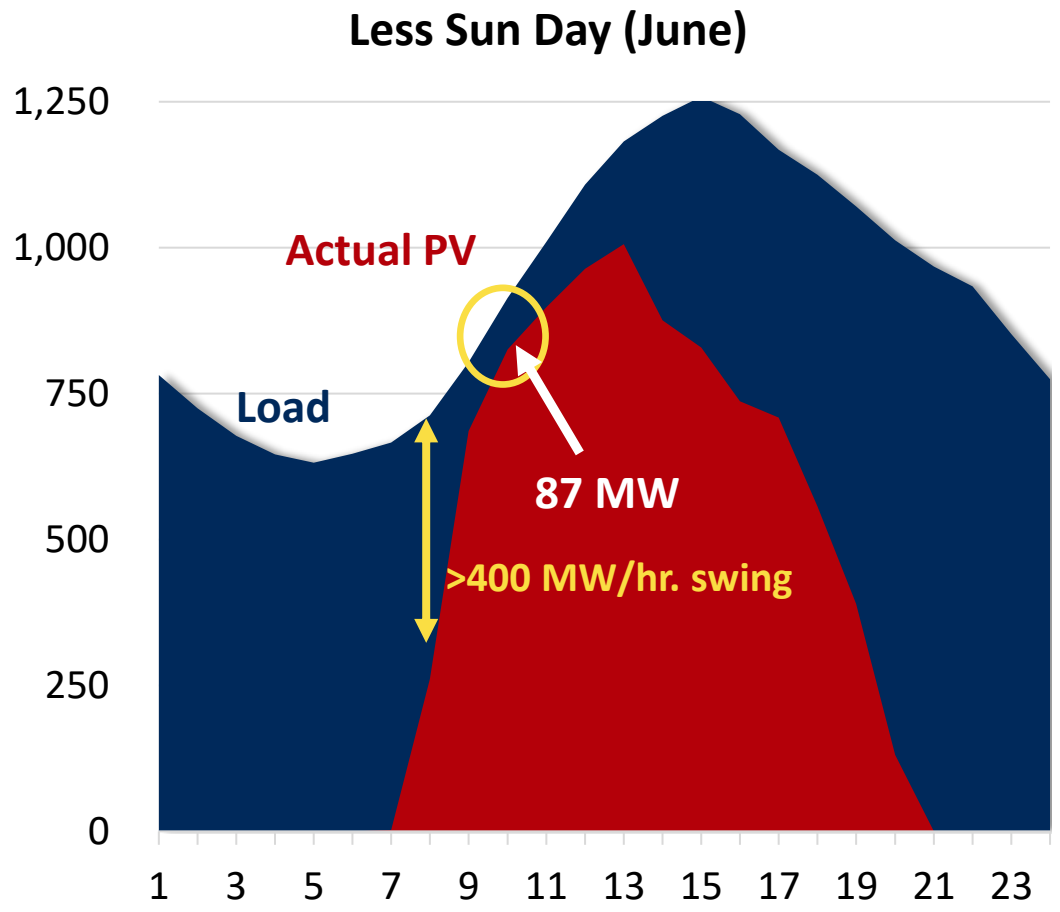
Storage to Capture PV Significant with ZEEC Approach

*PV Eclipses Load to Serve, Must Curtail or Store Excess Energy**



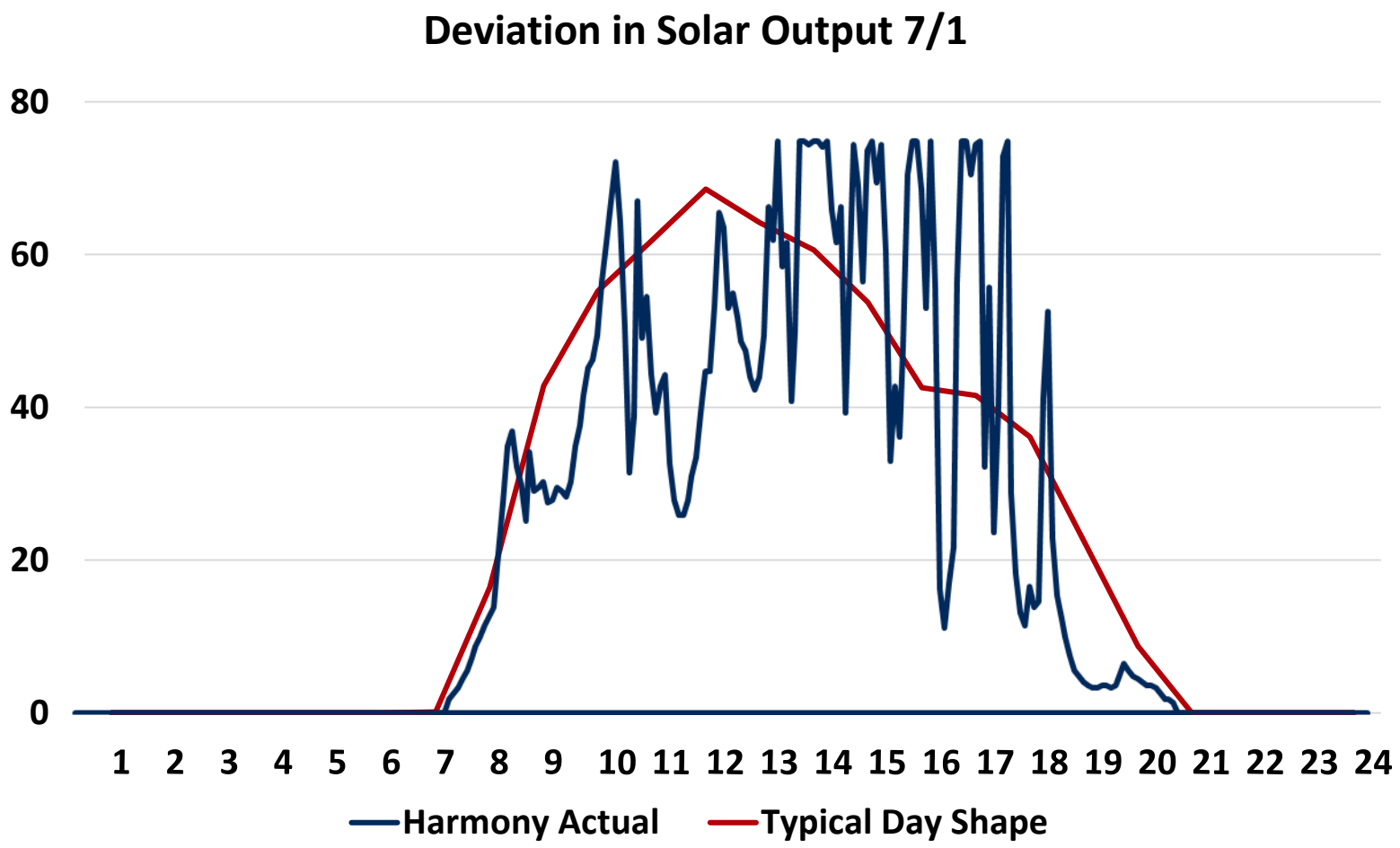


*Actual PV excess may be greater than shown as a function of avoiding cycling or turning off large baseload generators (e.g., nuclear)

Florida Solar Swings Significant Compared to Southwest

Small Swing in Solar Output Can Drastically Affect Energy

- Florida cloud patterns much different than SW US
- 5 min output may differ significantly from expected
- Varying solar output requires batteries or on-line gas generation to supply load
- In the extreme, synchronous condensers needed for grid stability



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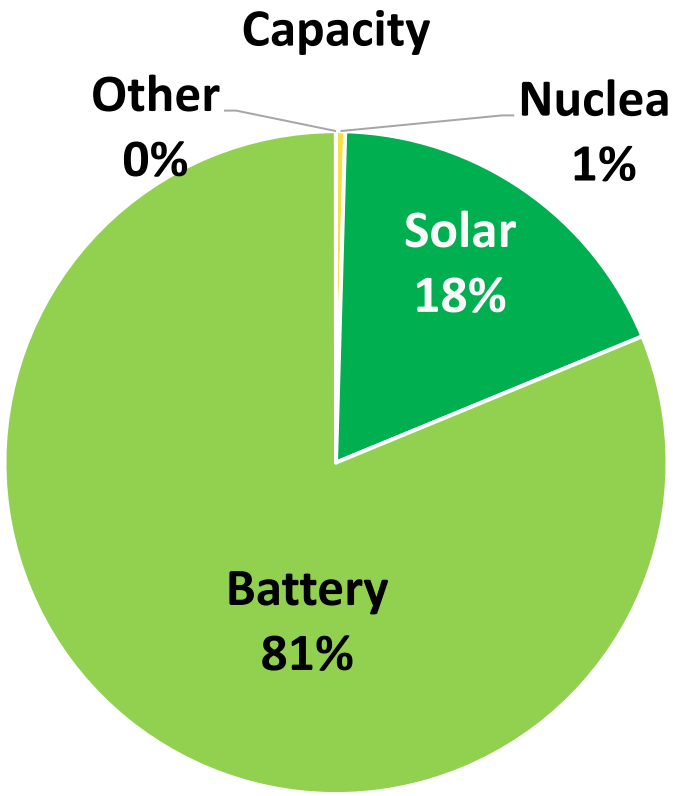
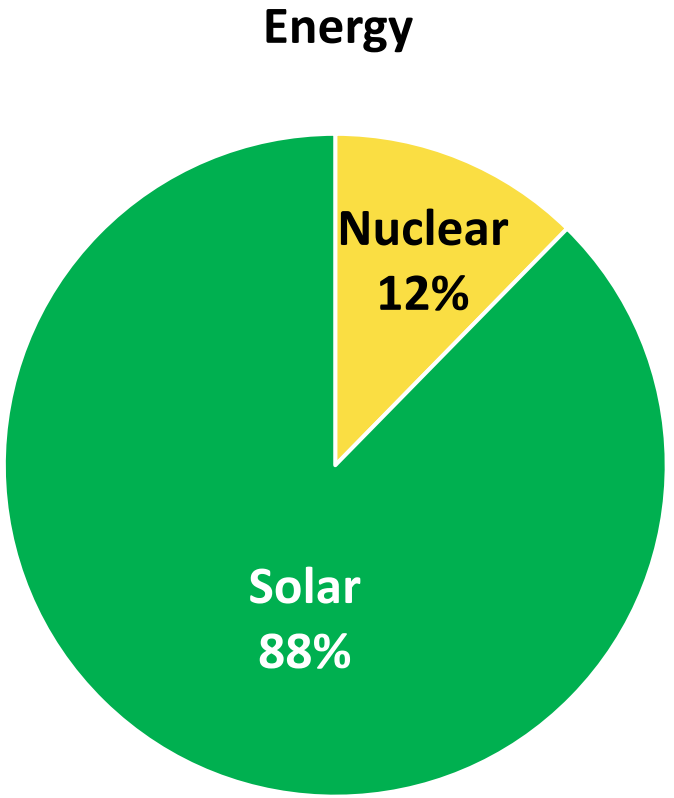
100% CO_2 Reduction Requires Extensive Overbuild

Excess Solar Required with Batteries at 14X Current Capacity



816,998 MW



238,535 GWh

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Under Significant Reduction, Large Solar Land Needed

Tight Buildable Land May Limit Availability

- Need land close to transmission that is buildable
- Florida total land area = 34,647,040 acres[1]
  - Agriculture 8.4 million acres (2016) (24% of FL)[2]
  - Solar land estimated to be required 1.3 million acres (4% of FL) or ~2,000 square mile – 1 square mile for every 100 MW of solar
- Cost per acre for suitable solar and battery would increase as demand surged
  - Leases range from $250-$2,000 per acre in more rural areas
  - Model assumes $10,000 per acre costs financed over 20 years

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1. https://dos.myflorida.com/florida-facts/quick-facts/
2. https://farmlandinfo.org/statistics/florida-statistics/

Climate Change Proposal in Budget Resolution – Sept.

Bundled with Wide Range of Other Infrastructure Spending

- Climate Change Budget Resolution proposal is 40 percentage point increase in net-zero CO_2 resources (ZEEC) in 10 years
- For FMPA, that means going from 5% net-zero resources (ZEEC) today to 45% by 2032
- No credit for switching from coal to gas – must be to ZEEC resource
- Payment in single year for performance above 4% increase ($150/MWh) with $40/MWh compliance penalty for incremental percentage not met

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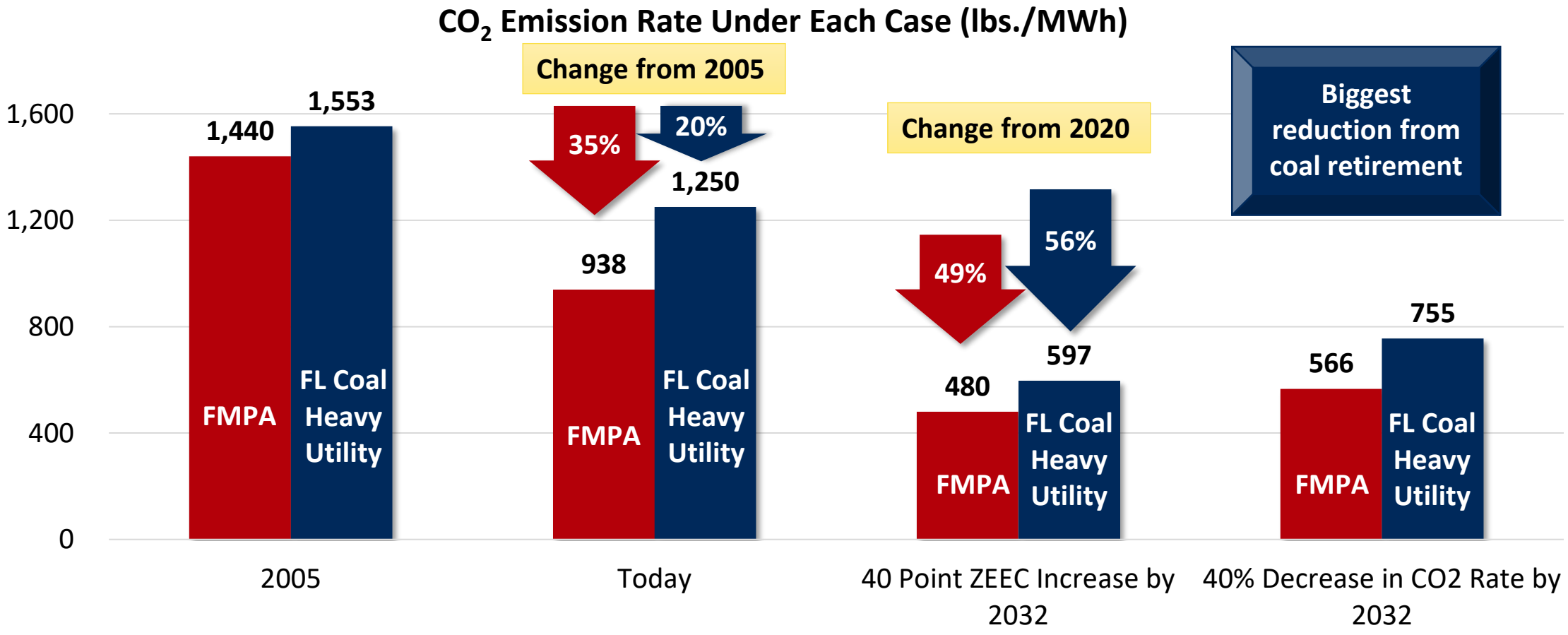
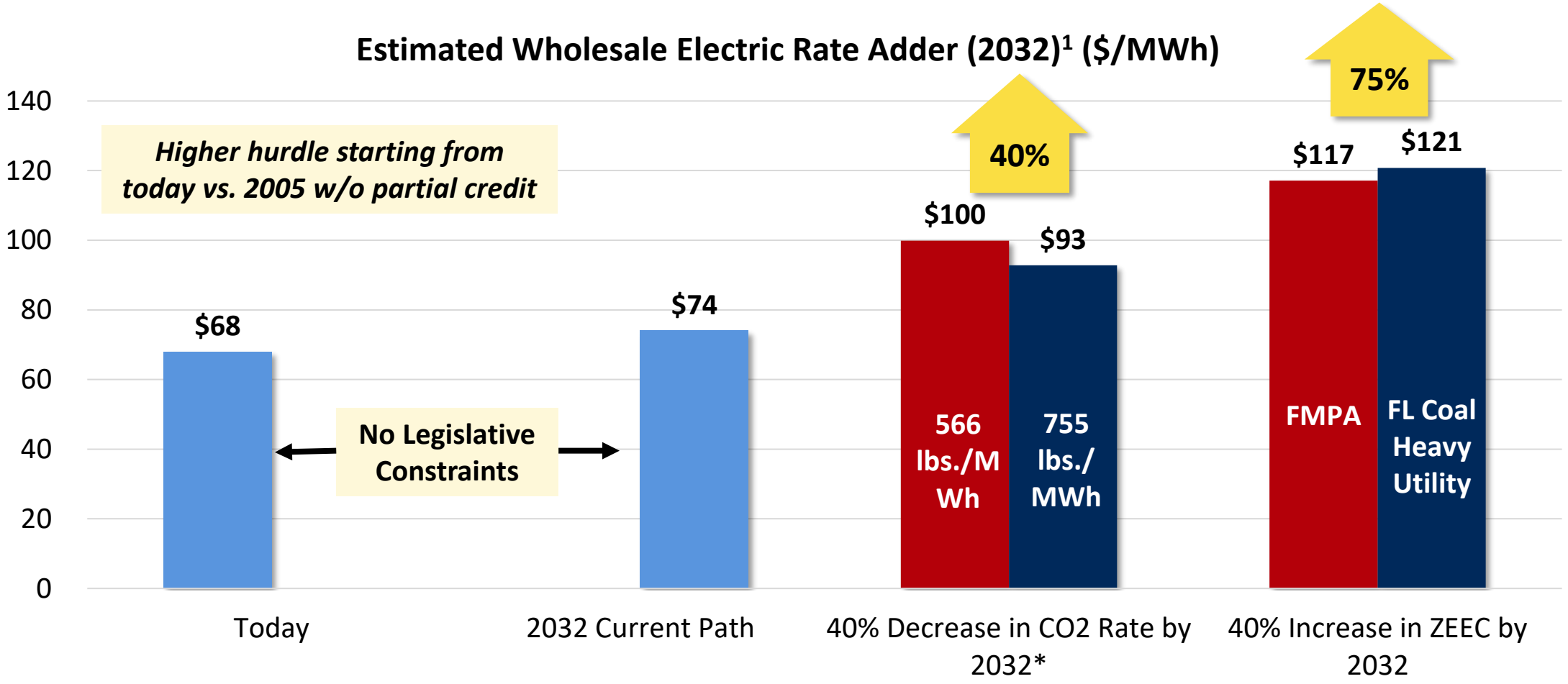
40 Point ZEEC Increase Far Bigger Impact/Cost than 40% Reduction in CO_2 Emission Rate



Less Price Pressure with CO_2 Rate Reduction Path

*ZEEC Increase Path Equals ~75% Rate Increase From Today**



1 - All cases at 3% inflation, No ITC. ITC may help provide a small cost offset on amortized solar assets.
*Performance payments are included and offset ~$2/MWh of investment in years received. Gas prices assumed to be reasonable (no escalation in gas prices due to gas shortages).

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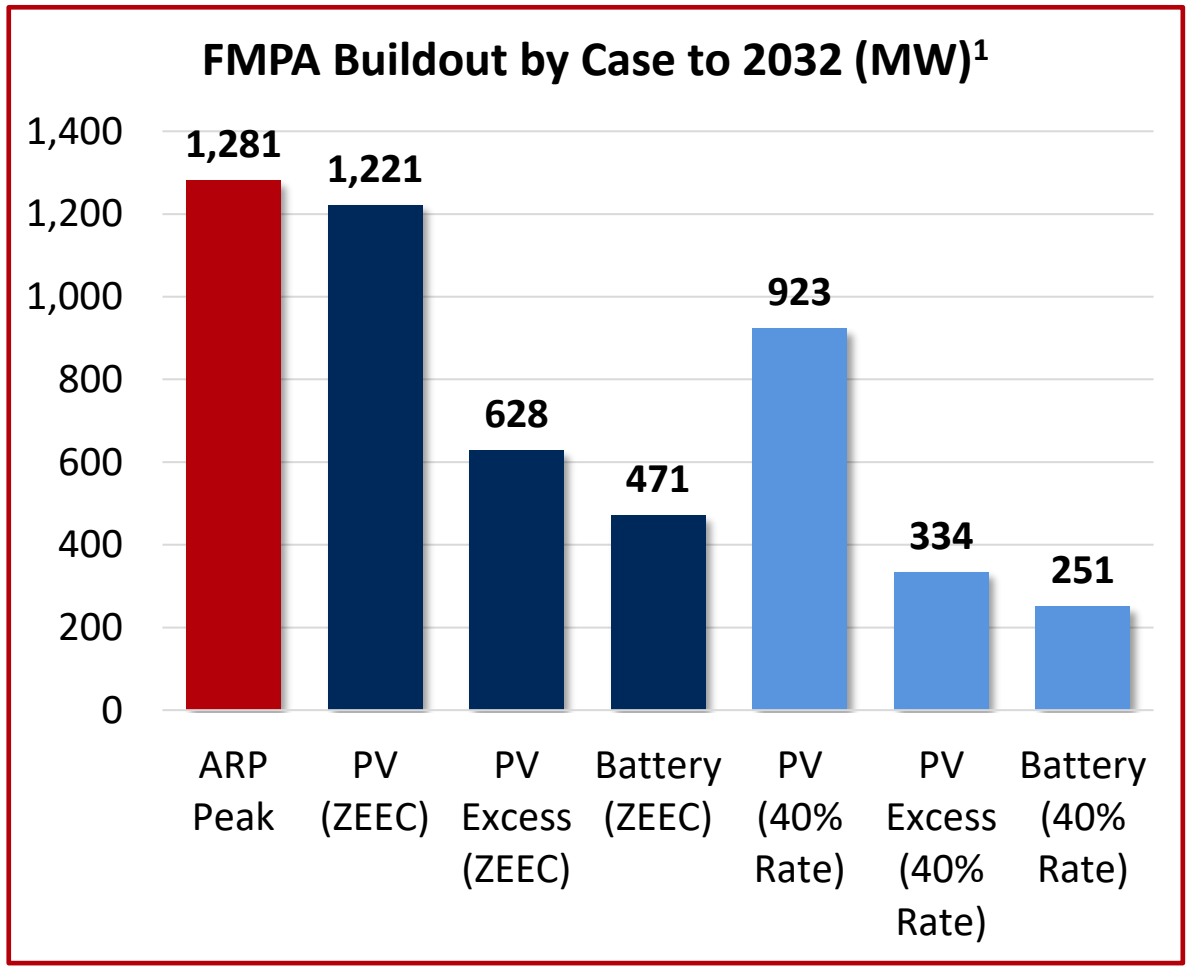
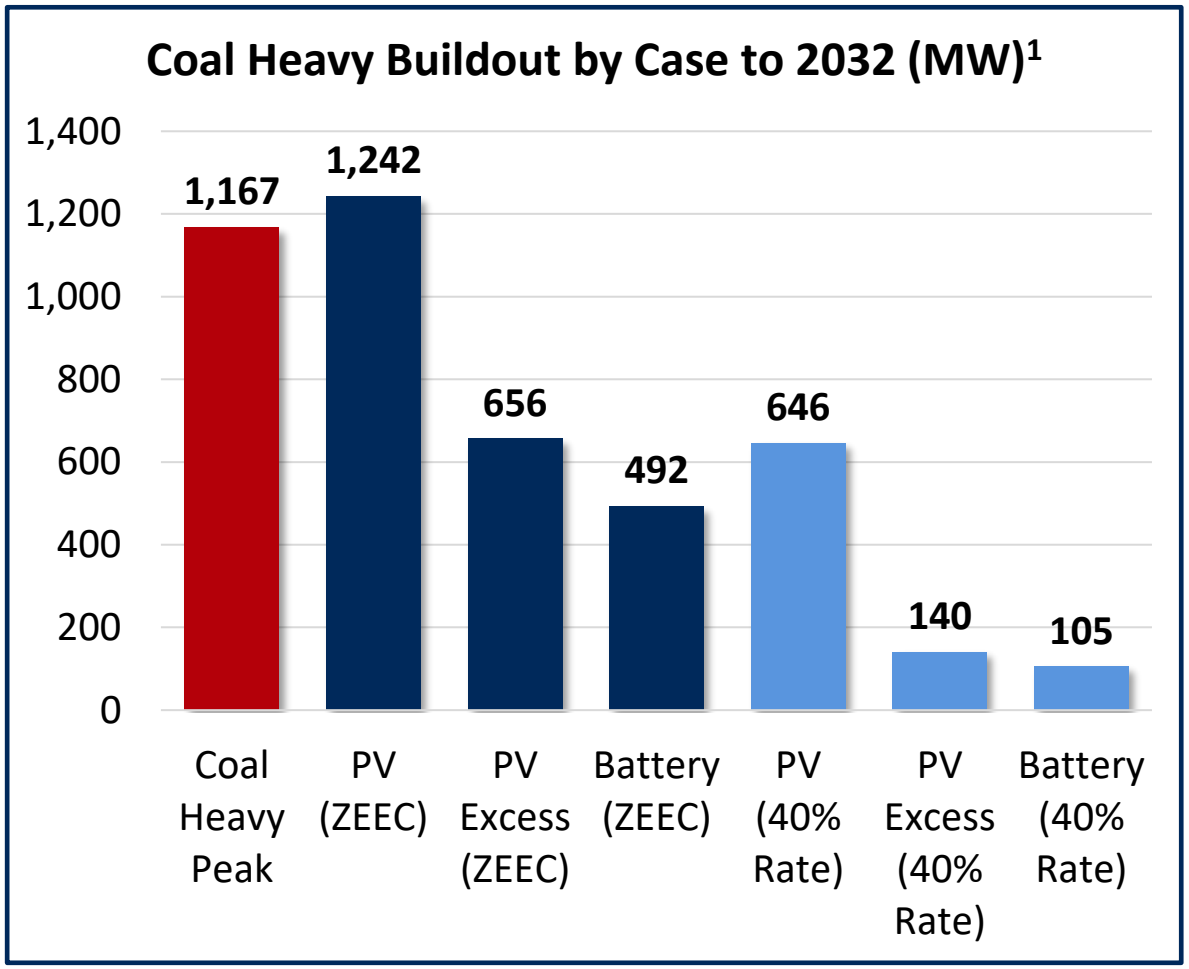
Renewable Capacity Exceeds Peak Load in ZEEC Case

Further Overbuild Required for Lower Starting Emission Rates





1- Battery cost modeled as two (2) 4-hour batteries at capacity shown. PV excess could be greater depending on the need to avoid cycling or turning off base load generation.

Cont. Resolution Climate Change Proposal Challenging

Aggressive, Costly Increase in Renewables over Next 10 Years

- Such a proposal would increase costs 70%–100% above expected costs by 2032 – tremendous demand for commodities and labor escalating costs
- Florida would have near impossible task in next 10 years of adding:
  - ~50,000 MW of solar – equivalent to entire Florida generation today
  - ~20,000 MW of batteries to capture excess solar during non-summer for night use
- Land availability, use permitting and transmission siting would strain system in many ways – 500 square miles of solar sites need plus transmission to each
- Crowds out new technology like small modular nuclear, better storage or hydrogen given permitting, investments and advancements required
- Performance payments do not compound and have limited long-term impact on utility costs passed on to customers

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