

Power Task Force Agenda Number 4.

MACRO OVERVIEW OF DESERT SOUTHWEST POWER MARKET - CHALLENGES AND OPPORTUNITIES

CENTRAL ARIZONA PROJECT
POWER TASK FORCE MEETING

MAY 18, 2017

DALE PROBASCO
MANAGING DIRECTOR
GLOBAL GENERATION SERVICES

DISCLAIMER

Notice Regarding Presentation

This presentation was prepared by Navigant Consulting, Inc. (Navigant) for informational purposes only. Navigant makes no claim to any government data and other data obtained from public sources found in this publication (whether or not the owners of such data are noted in this publication).

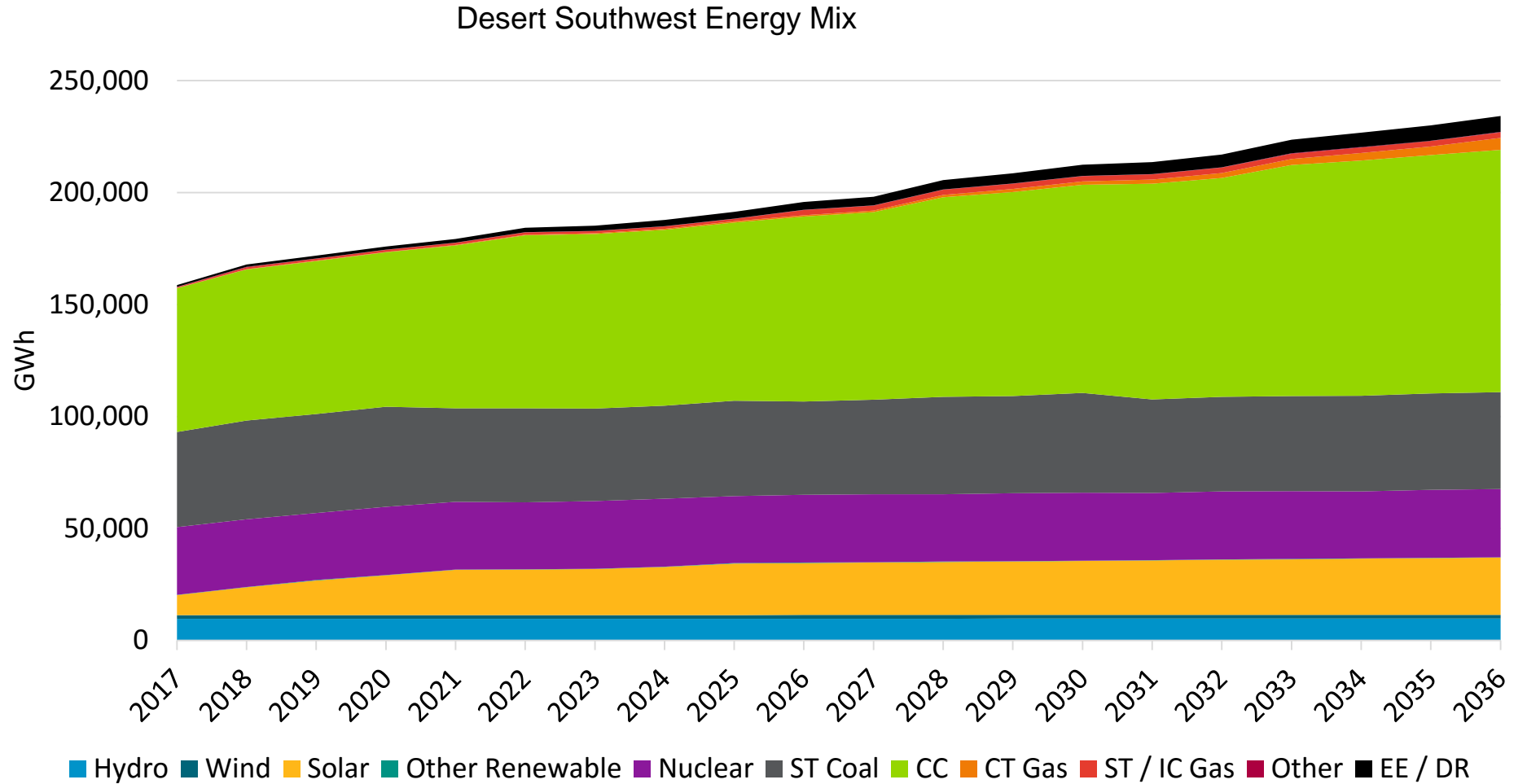
Navigant does not make any express or implied warranty or representation concerning the information contained in this presentation, or as to merchantability or fitness for a particular purpose or function. This presentation is incomplete without reference to, and should be viewed solely in conjunction with the oral briefing provided by Navigant.

DISCUSSION POINTS

- DSW Market Overview
- Forecast Coal/Gas Pricing
- Future Challenges/Considerations

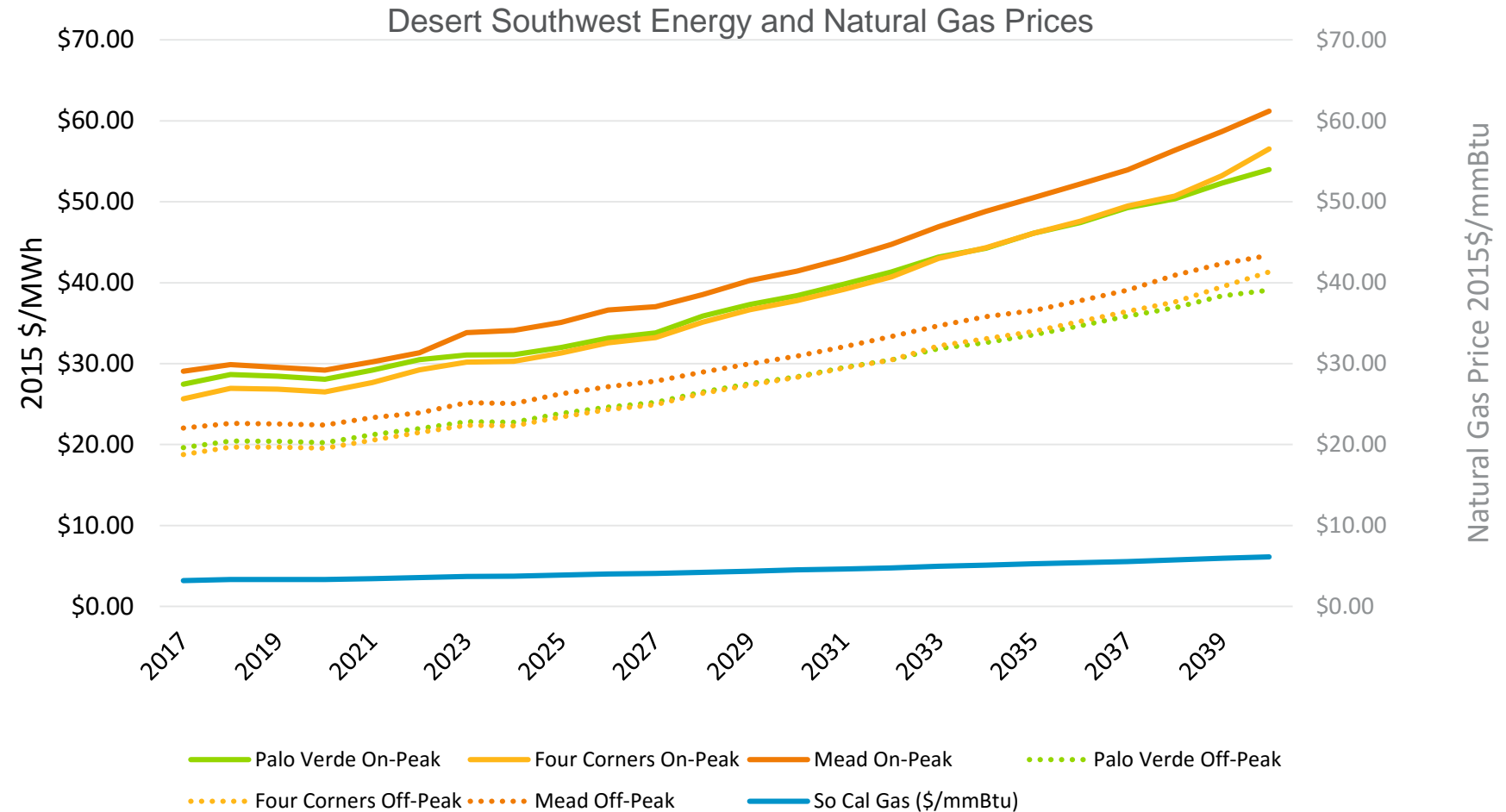
DESERT SOUTHWEST MARKET SUMMARY

- The region will see increased generation primarily from natural gas-fueled resources, and from solar resources.
- Generation from coal-fueled resources is projected to stay somewhat stable.
- Remaining coal plants are projected to see higher dispatch/capacity factor.



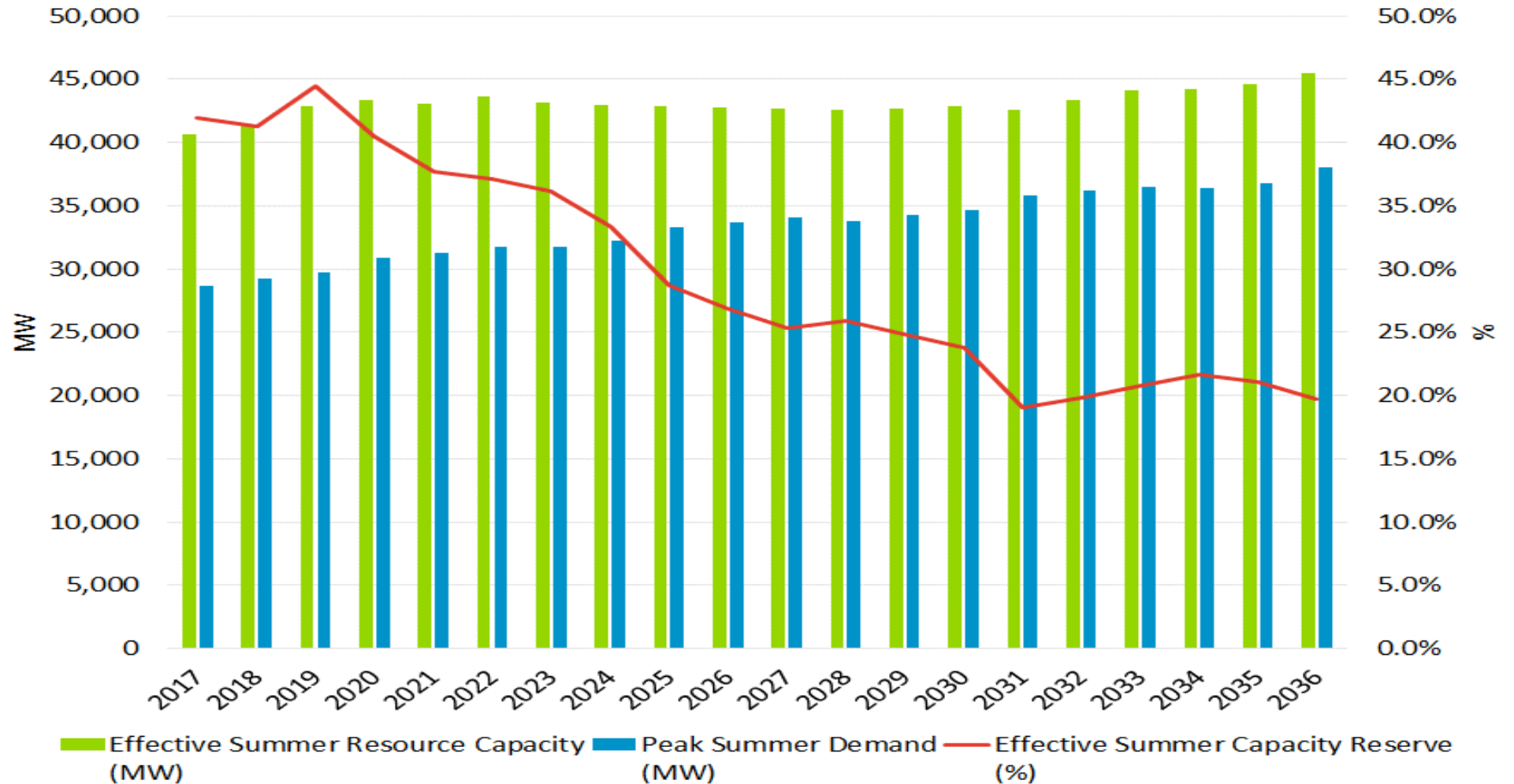
DESERT SOUTHWEST MARKET SUMMARY

- Navigant forecasts natural gas prices to remain relatively flat through 2020, and to then increase. Forecast assumes pipeline expansion will occur to keep pace with demand and supply, which is conservative. In reality, a lag is more likely, with higher and more volatile prices
- Regional energy prices follow a similar trend, staying relatively flat through 2020, then increasing with natural gas prices through time.
- Natural gas-fueled generators are typically the marginal resource in the Desert Southwest energy markets



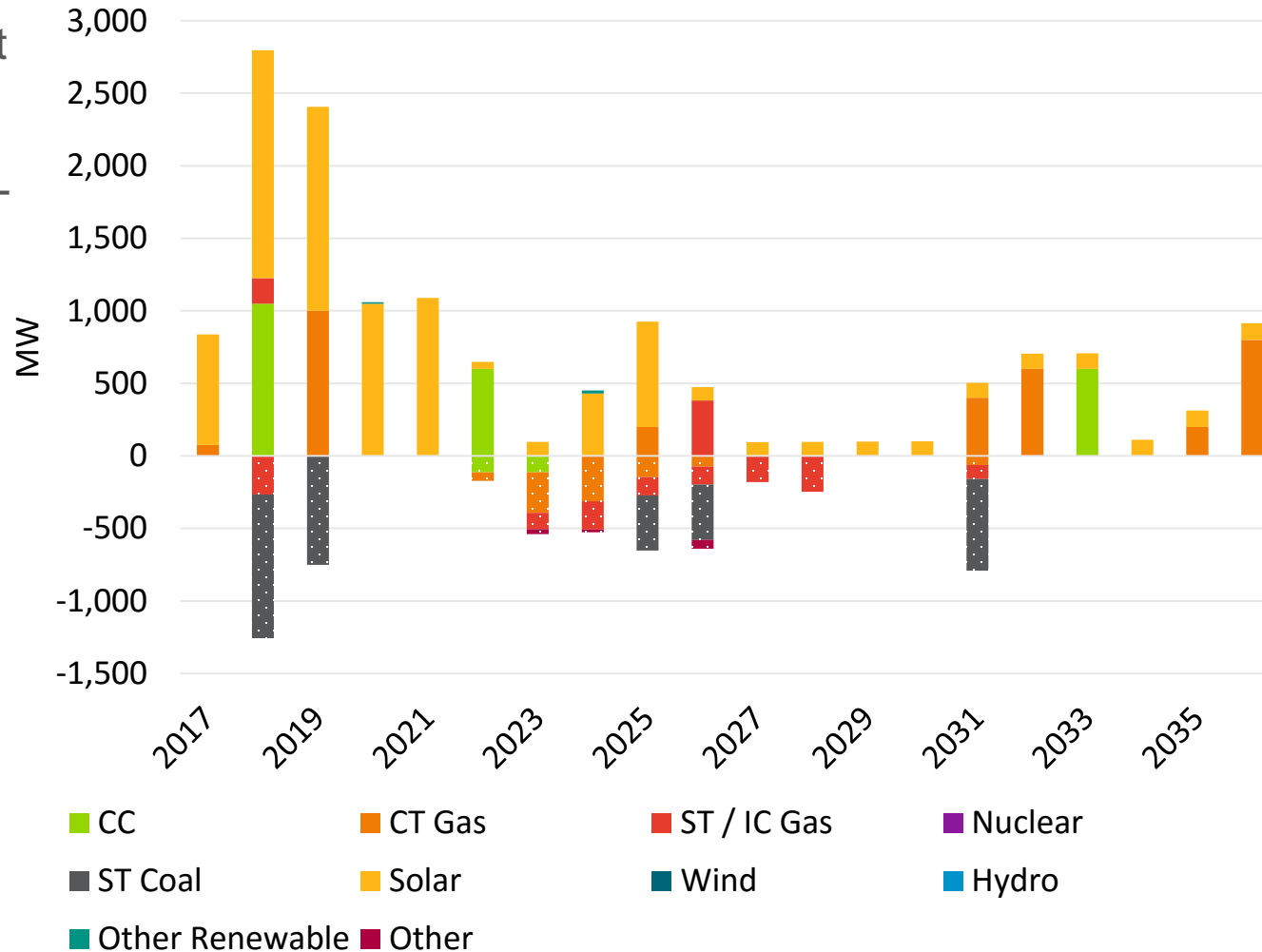
DESERT SOUTHWEST SUPPLY AND DEMAND BALANCE

- DSW exhibits high capacity margins in the early years
- Capacity margins grow tighter with relatively flat reserve capacity, and continued load growth, and is projected to steadily decline toward equilibrium levels in the 20 percent range



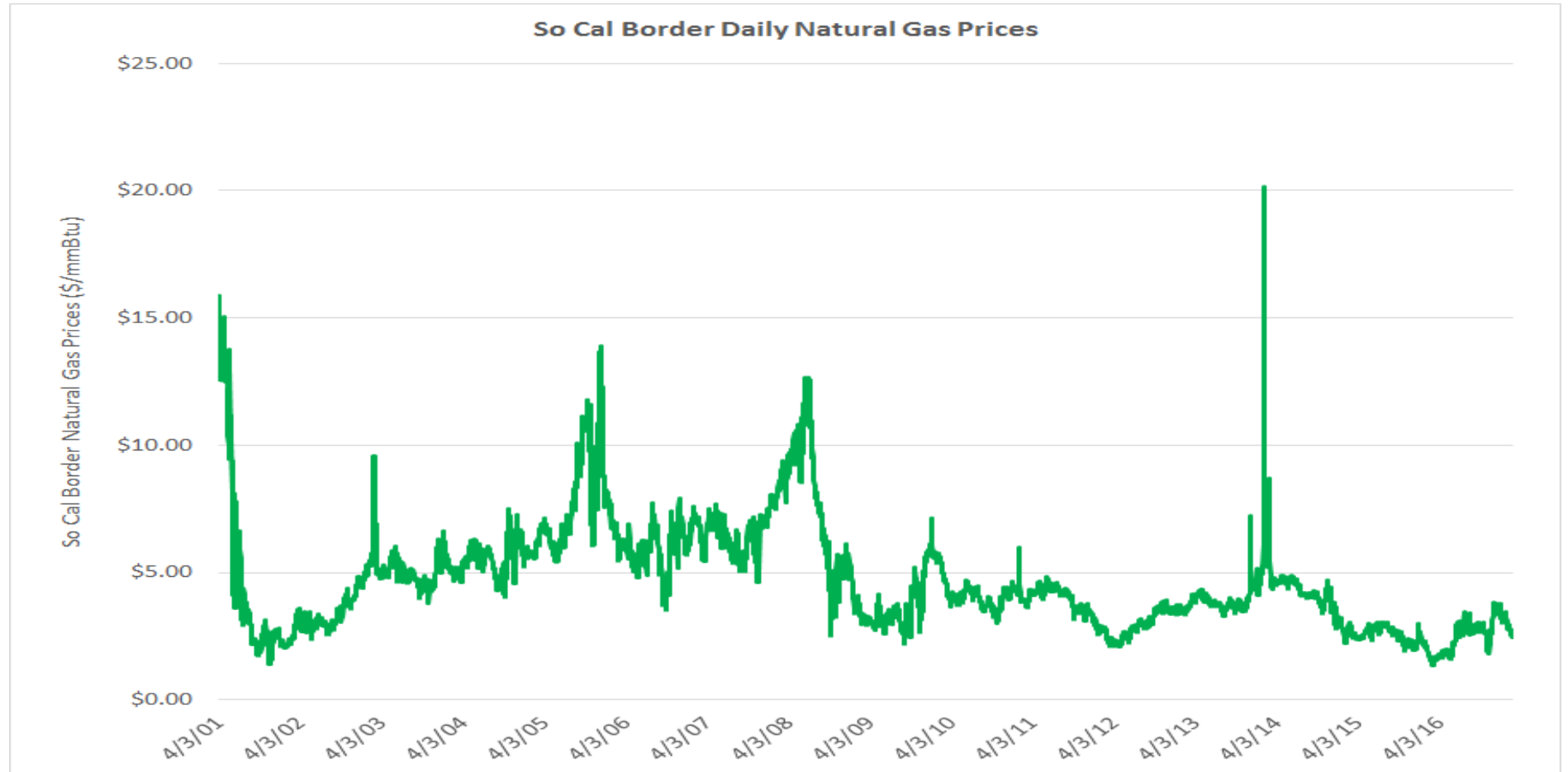
DESERT SOUTHWEST CAPACITY ADDITIONS AND RETIREMENTS

- Retirements consist of coal (including NGS Unit 1), and older GT, IC and ST units
- Additions are natural gas fueled simple and combined cycle, and solar



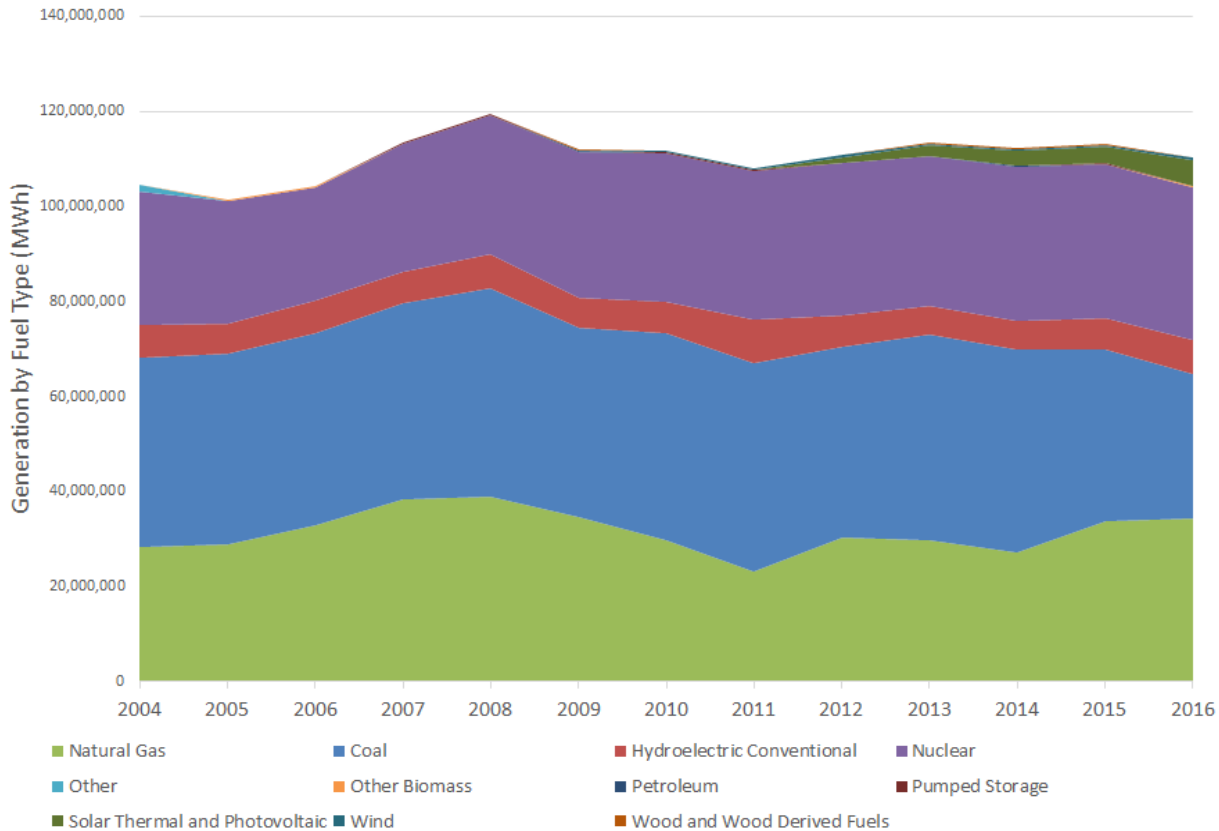
NGS PROVIDES FUEL DIVERSITY BENEFITS

- While current natural gas market conditions are favorable, there remains the concern on natural gas price volatility which has occurred even during the shale gas expansion

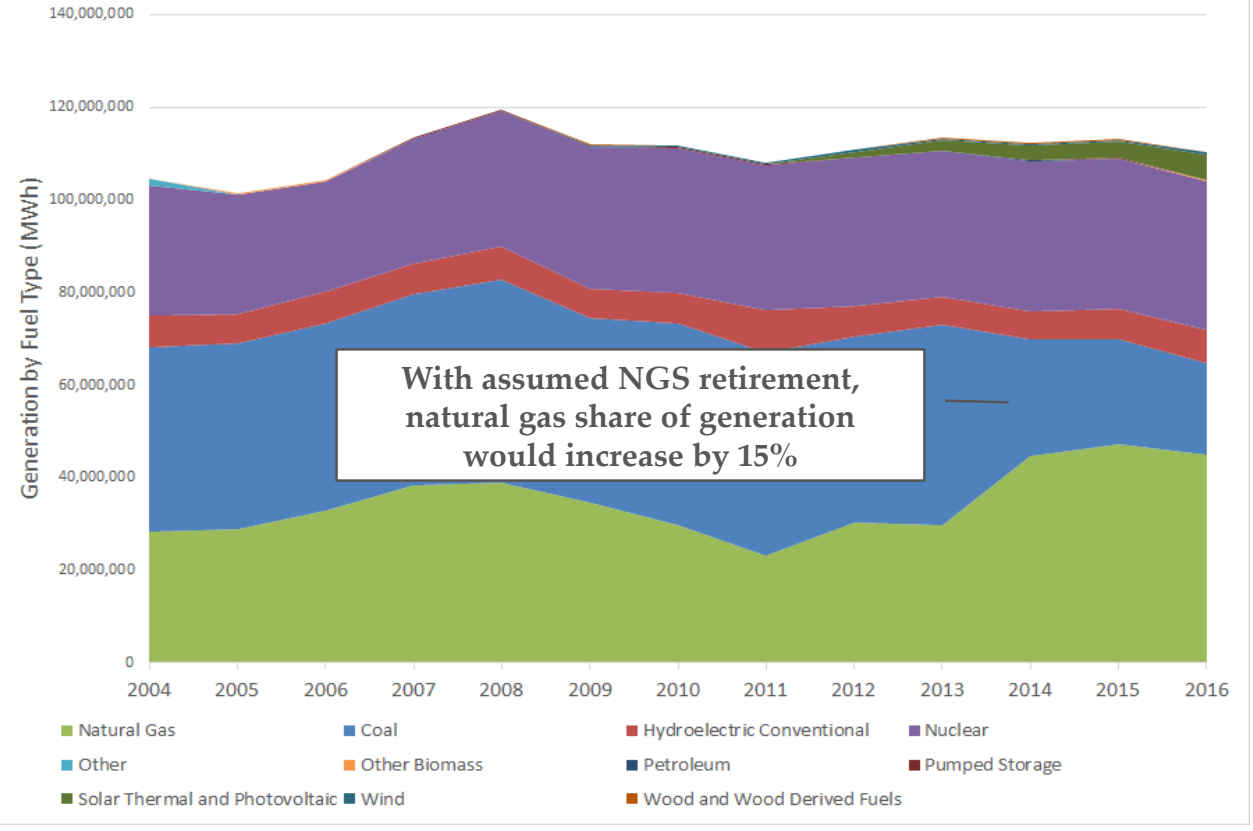


NGS PROVIDES FUEL DIVERSITY BENEFITS

Arizona Generation by Fuel Type (MWh)



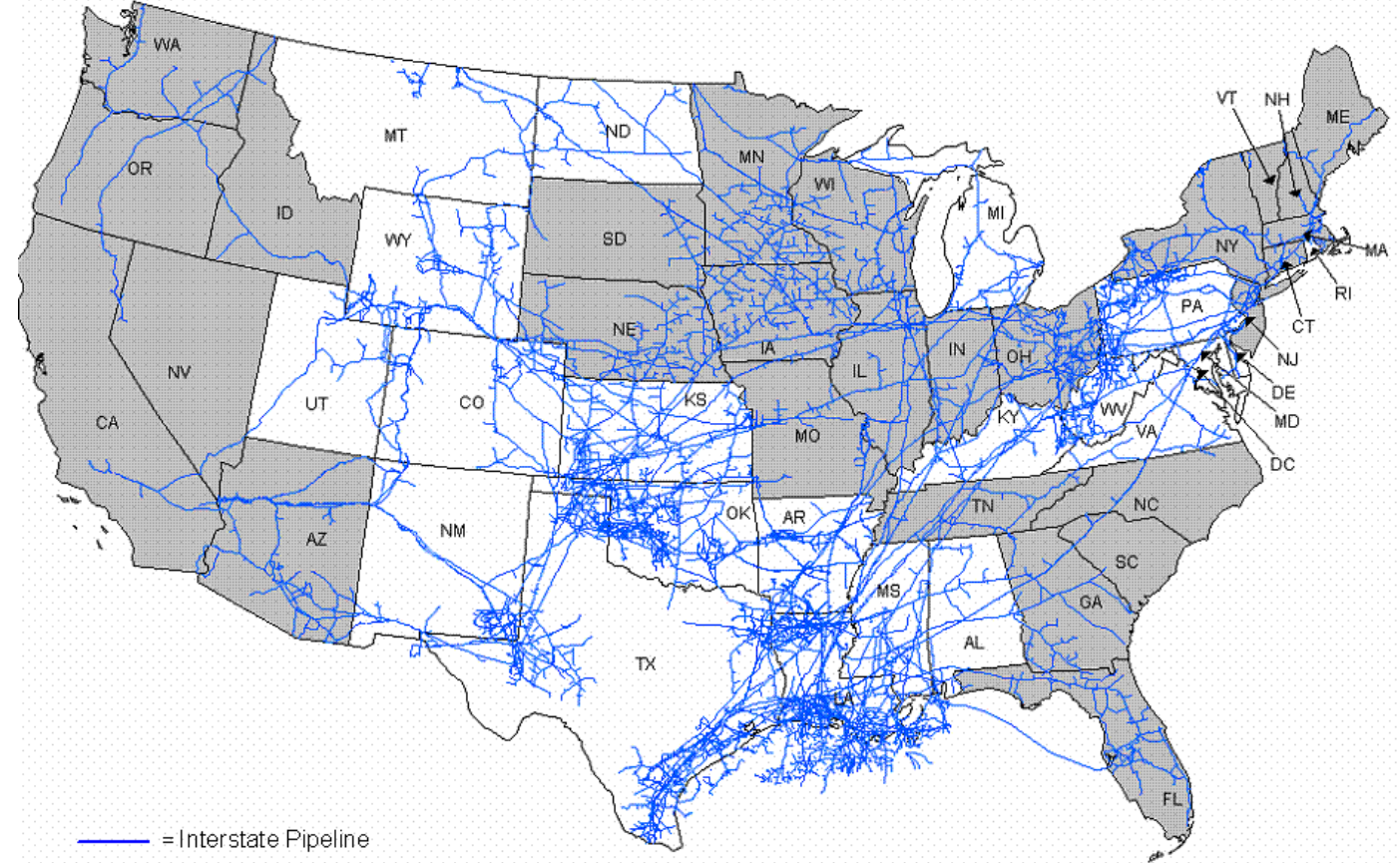
Arizona Generation by Fuel Type - Adjusted for Navajo Retirement (MWh)



- With San Juan retirement, and potential NGS retirement, the share of natural gas fueled generation in Arizona will increase by 15%, and exceed 40% of total generation. NGS has averaged 15% of AZ generation over 2004-2016 period

NATURAL GAS CONSIDERATIONS FOR ARIZONA

- Nearly all of the natural gas consumed in Arizona is imported from other states
 - Interstate gas imports are via pipelines that enter Arizona at the New Mexico border.
 - Approximately 70% of the gas that is imported into Arizona comes from one pipeline (El Paso)
 - Competition for Southwest gas is increasing with over 70% of pipeline gas that comes into Arizona, continuing on to California and Mexico
 - Supply disruption on El Paso pipeline was one of the triggering events for California Energy Crisis in 2000-2001
- The amount of gas that comes into Arizona and goes into Mexico is up 50% from 2013
- Arizona has no natural gas underground storage capacity, and has attempted to build storage fields to buffer against supply disruptions, but have encountered financial and environmental issues.



UNITED STATES LNG EXPORT OUTLOOK IS ROBUST

Navigant Forecasts:

- **10 Bcfd** US LNG exports by 2022
- **US LNG exports** to represent about **12%** of **US** total NG demand by 2022
- **Forecast assumes LNG projects under construction**
- **Other LNG projects** appear promising

Sabine Pass, LA

- 2 trains on stream in 2016 (1.38 Bcfd)
- Around 60 cargoes of LNG in 2016; most went to Asia and Latin America
- 3 more trains between 2017 and 2019

Cameron LNG, LA

- 2 additional trains approved by FERC in May 2016
- DOE export approval July 2016 for 1.4 Bcfd
- In construction and on stream 2018

Freeport LNG, TX

- 3 trains under construction (1.7 Bcfd)
- 1 additional train filed to FERC in May 2015 (0.9 Bcfd)
- On stream 2019

Corpus Christi, TX

- 2 trains under construction (1.1 Bcfd)
- 3 other trains planned
- On stream 2018

Cove Point, MD

- 1 train under construction (0.77 Bcfd)
- Next project On stream in late 2017

CHALLENGES SUMMARY

The future is always uncertain

- Fuel prices are generally always in some period of change so a focus on market fundamentals helps deal with uncertainty
- A robust capacity market is missing in many parts of the country and will impact reliability. The DOE study will be looking at this issue
- Variable generation (i.e. solar/wind) has driven many capacity players out of the market
- Exporting renewable energy can have significant impacts on surrounding areas/states
- How we make the transition to a renewable future is a major consideration. Going too far too fast can dramatically impact reliability and may impact those who can least afford it the most.
- DER/the Energy Cloud may be the most disruptive of all. This change will impact central generation of all types (Fossil, Nuclear, Hydro, Wind, etc.)