



Electric Generation: Trends, Challenges & Mitigation Measures

July 16, 2019

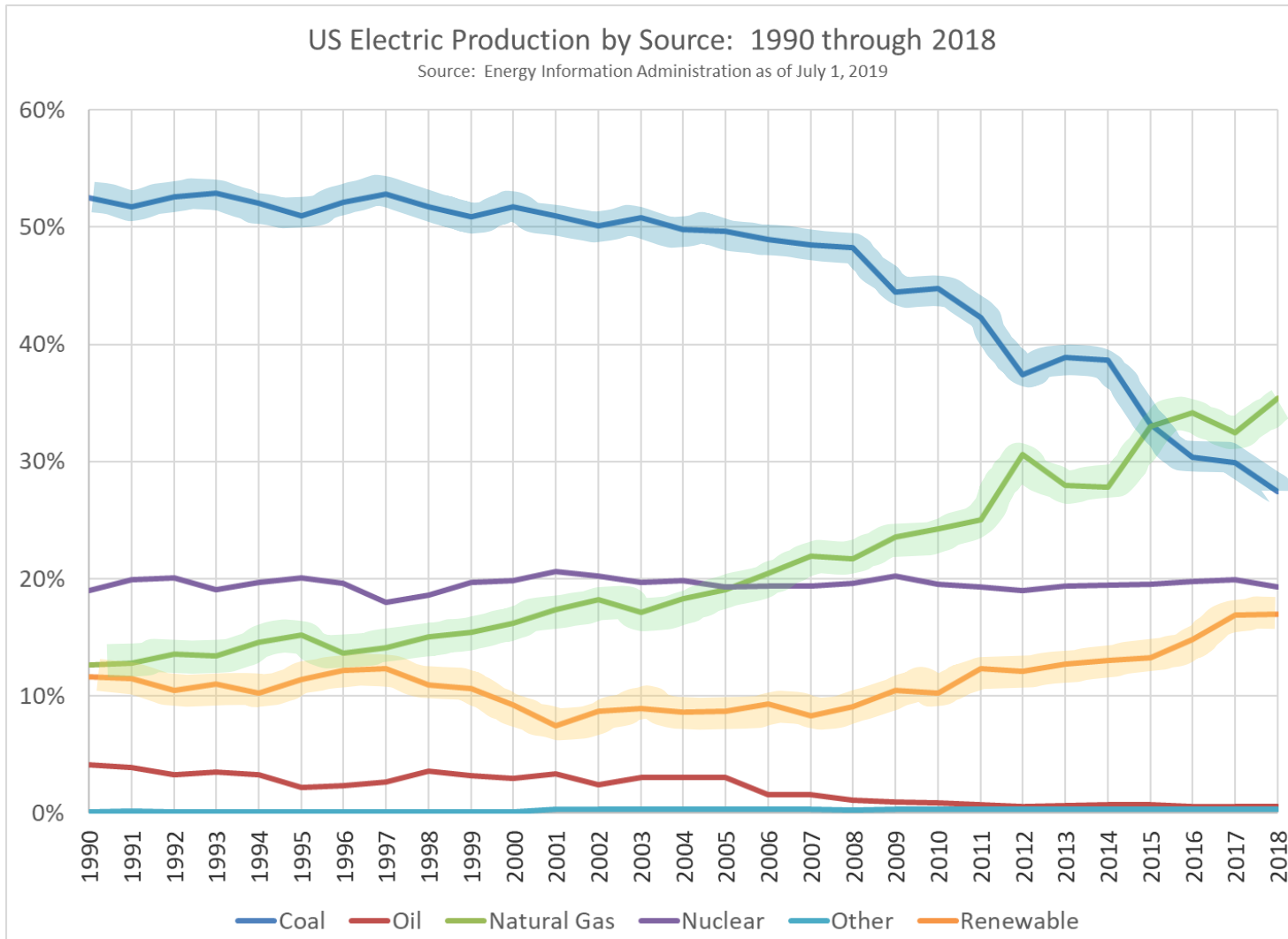
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Topics

- U.S. Electric Regulated Generation Trends
- Duke Energy Regulated Generation Portfolio
- Challenges / Mitigation Measures
- Questions

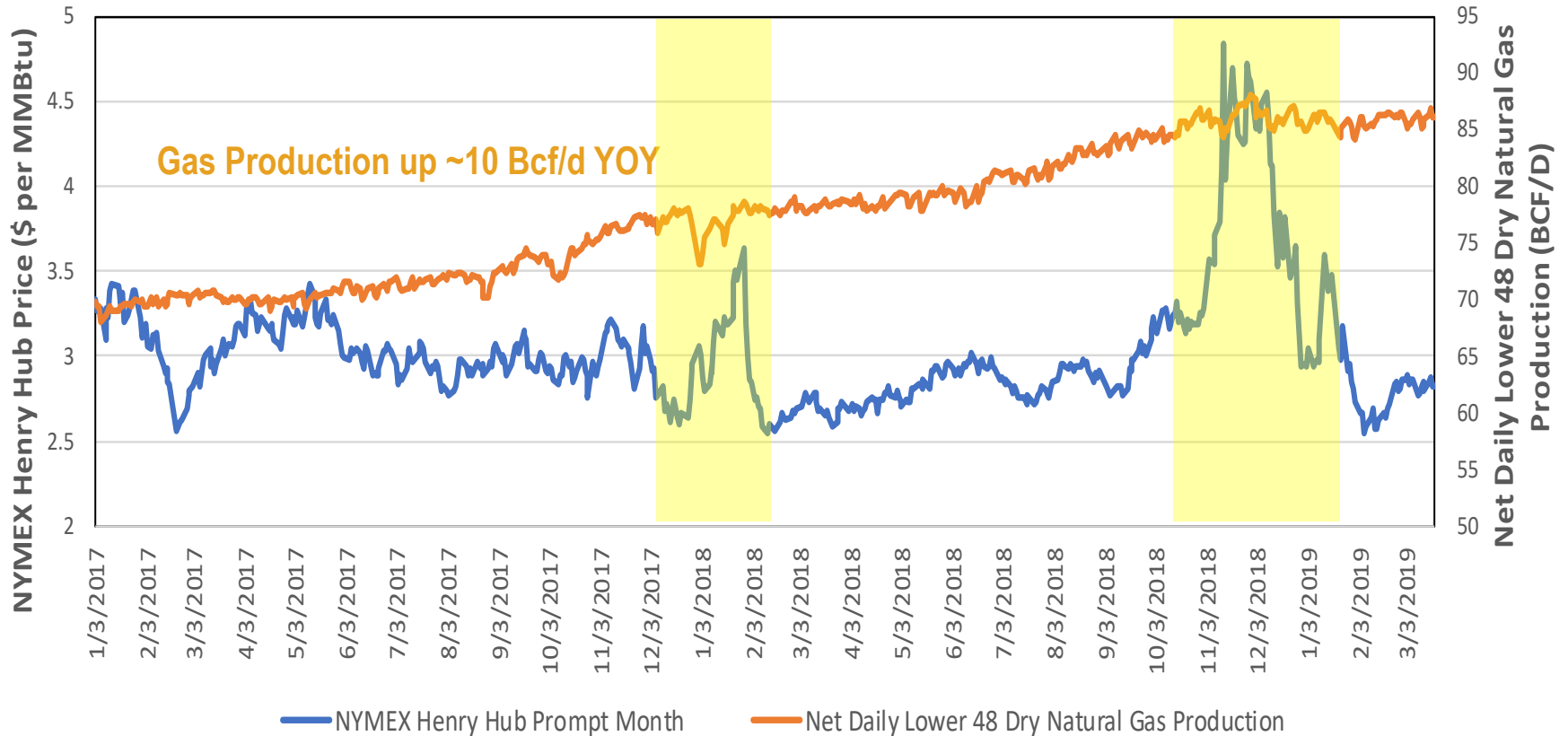
U.S. Electric Generation Trends – All Sources



U.S. Electric Generation Trends – Gas Production & Price

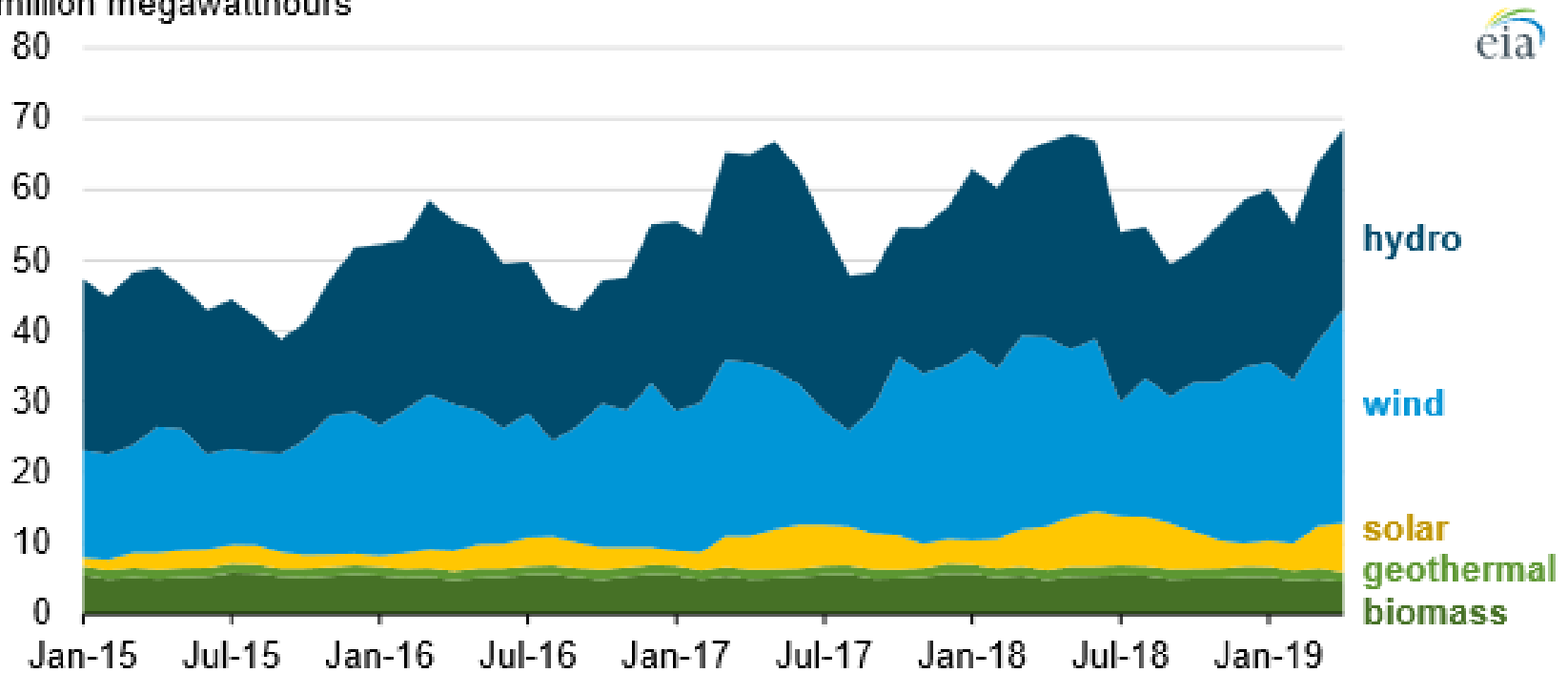
Forward NYMEX Strip Annual Prices as of 7/5/19 close

5 Year Average: \$2.61		
Bal19: \$2.48	2021: \$2.57	2023: \$2.67
2020: \$2.56	2022: \$2.60	

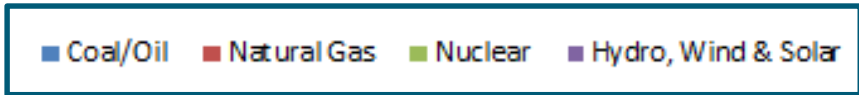
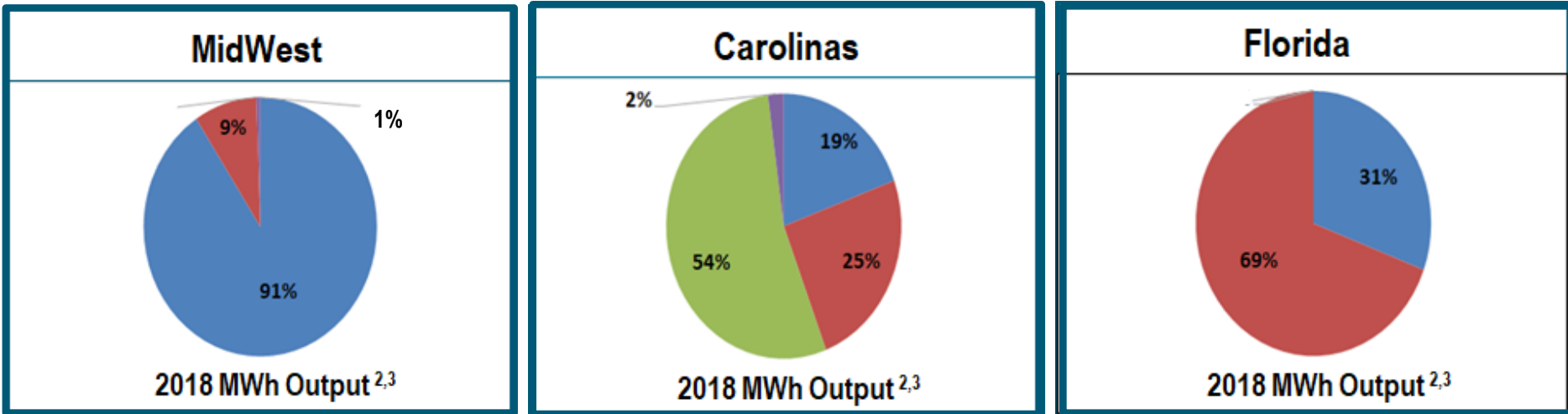


U.S. Electric Generation Trends - Renewables

U.S. monthly electricity generation from renewable energy sources (Jan 2005-Apr 2019)
million megawatthours

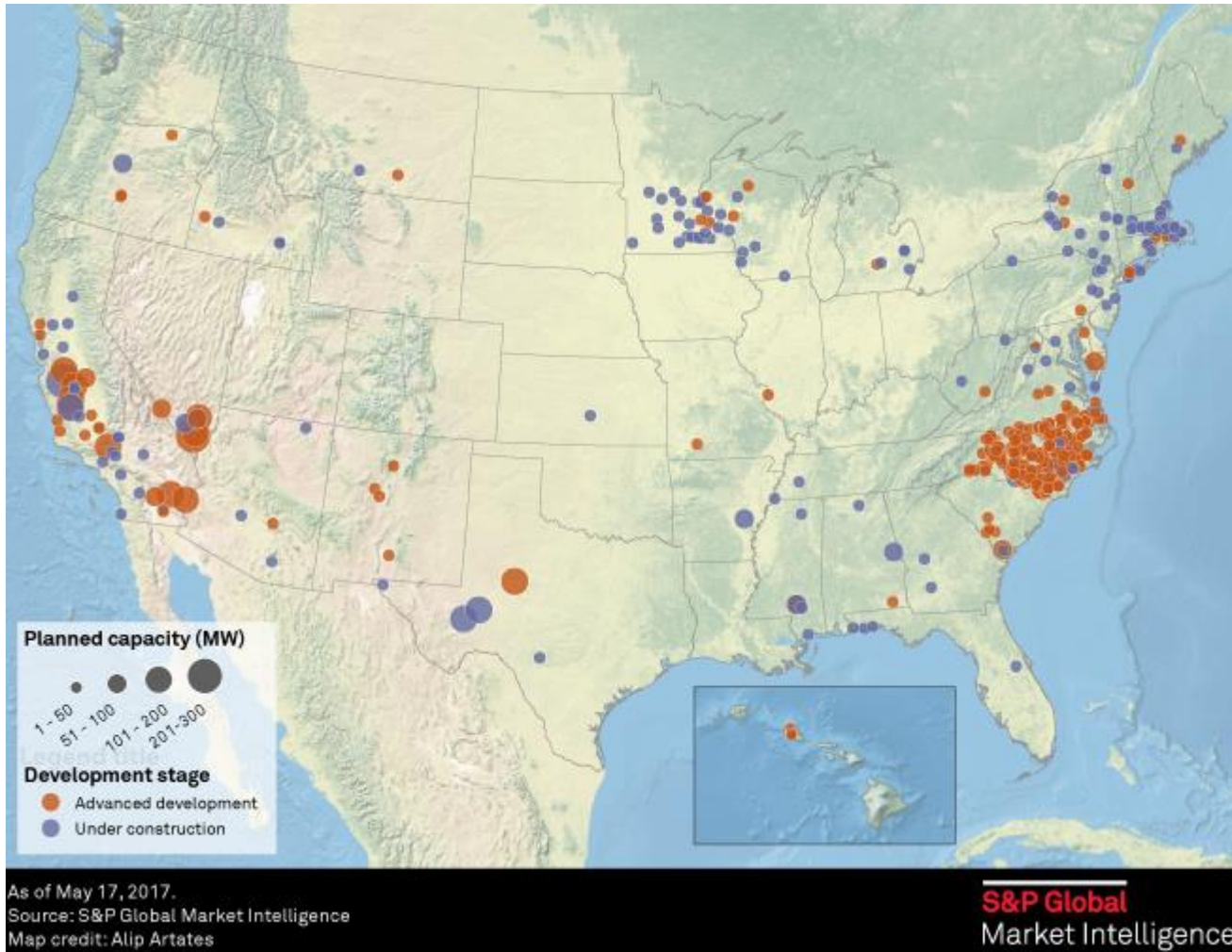


Duke Energy Generation Portfolio – 2018 Jurisdictional View



- Targeting 40 % reduction in CO₂ emissions by 2030 from 2005 levels¹
 - Retired ~6 GW of coal between 2011 and 2018

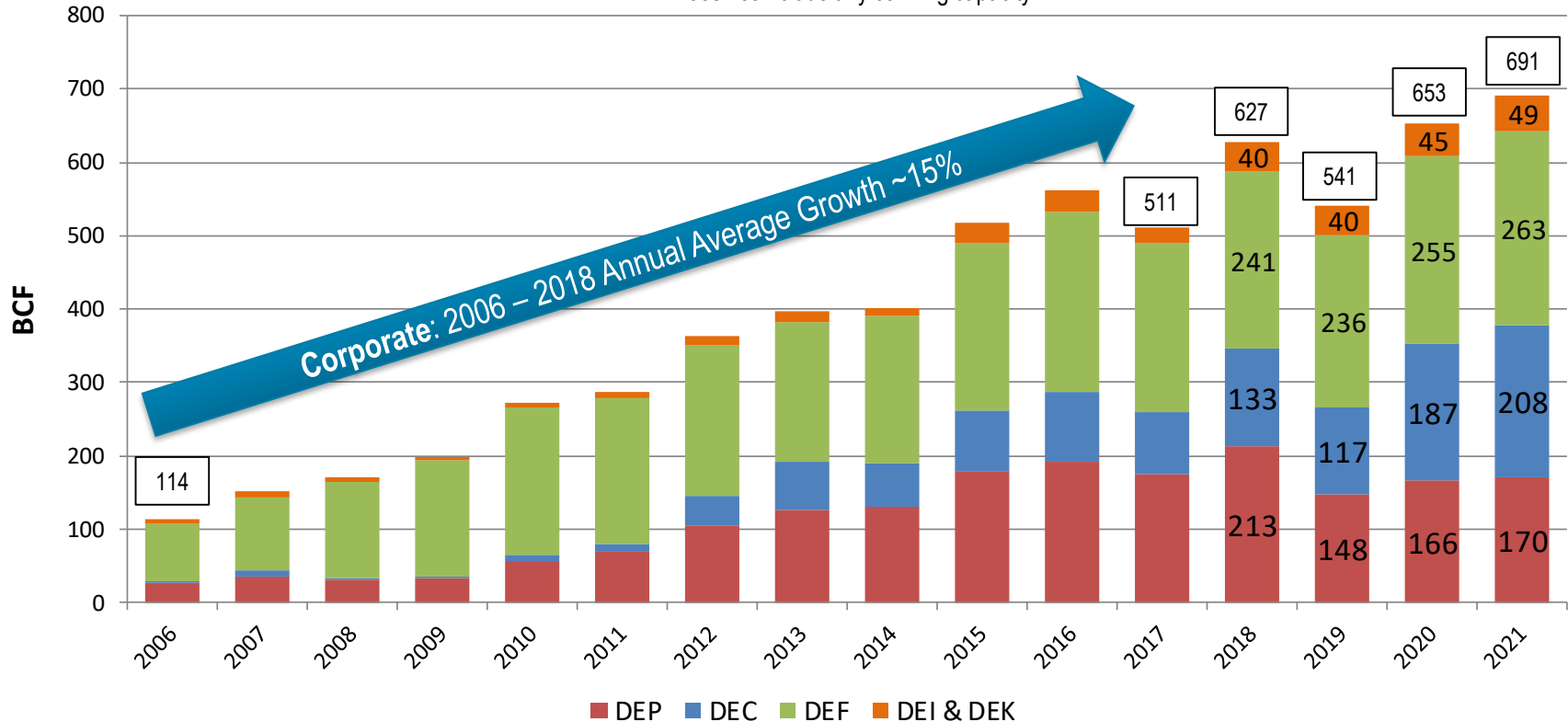
Duke Energy Generation Portfolio – Solar



Duke Energy Generation Portfolio – Gas Consumption Trend

Gas Generation Capacity ⁽¹⁾	Carolinas	Florida	Midwest
Total	11,438 MW	8,594 MW	2,541 MW
<i>Announced additions through 2020</i>	<i>973 MW</i>	<i>0 MW</i>	<i>0 MW</i>

⁽¹⁾ Approximate capacity totals. Summer MW ratings of owned and tolled generating units. Does not include any co-firing capacity.



Forecasted gas burns for 2019 and beyond include owned and tolled generating units are estimates as of 3/15/2019 that are subject to change over time. Previous years are unaudited actuals of owned and tolled facilities gas usage.

Confidential – For Discussion Only - Subject to Change

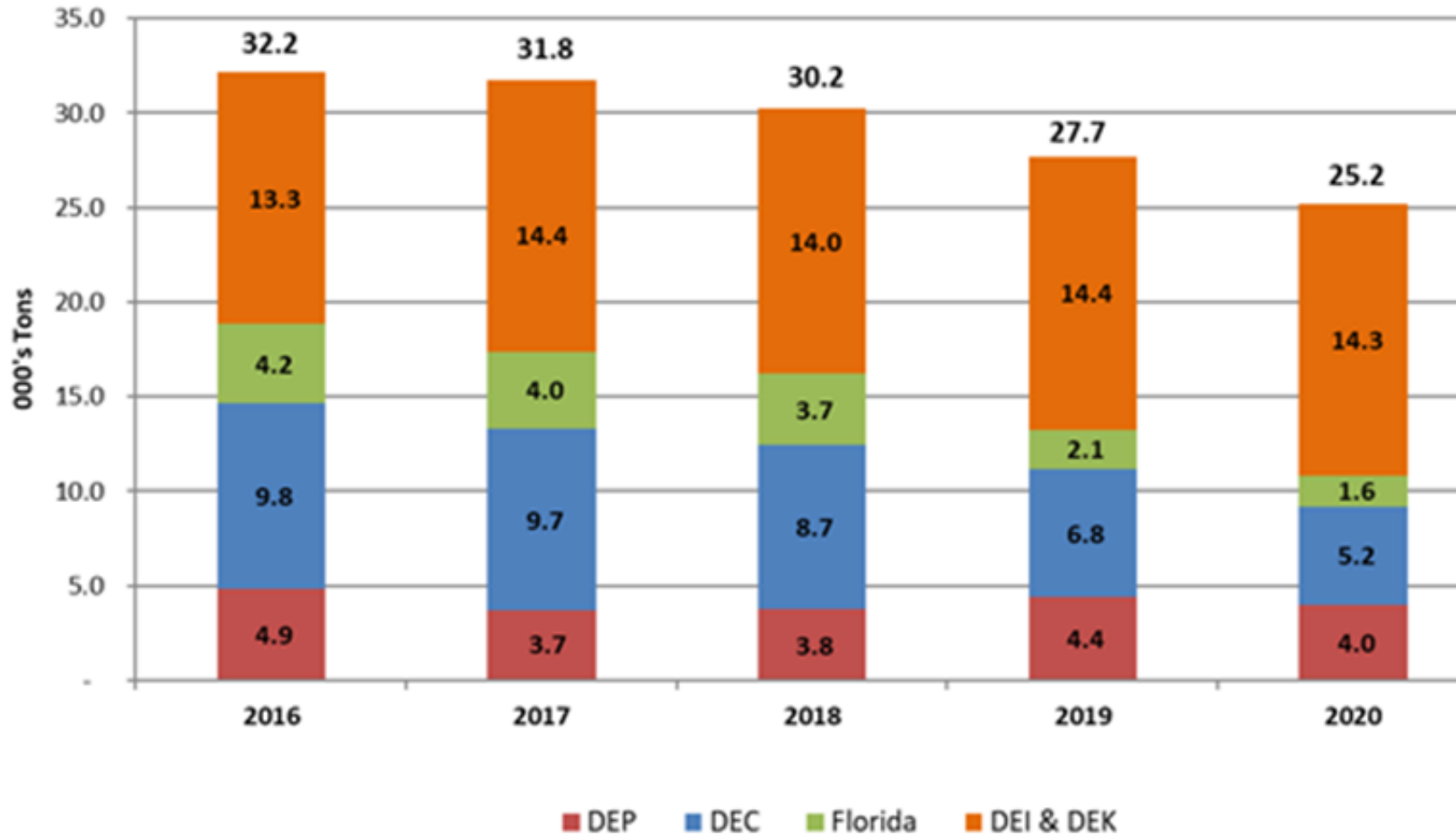
Duke Energy Generation Portfolio – Gas Plant Additions

Asheville CC (as of 4/3/19)

- **Asheville CC** (550 MW): COD Late 2019
 - Part of Western Carolinas Modernization Project
 - Includes adjacent solar array and battery storage
 - Combined Cycle project is ~80% complete
- **Clemson CHP** (21 MW): COD Late 2019
 - Will produce 100,000 lbs of steam per hour and can island university
- **Lincoln CT** (402 MW): COD Early 2020
 - Partnering with Siemens on new generation of turbines

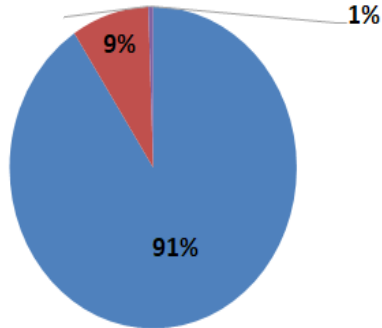


Duke Energy Generation Portfolio – Coal Consumption Trend

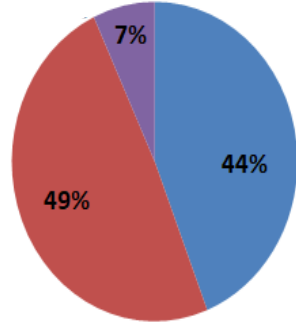


Duke Energy Generation Portfolio – Future Jurisdictional View

MidWest

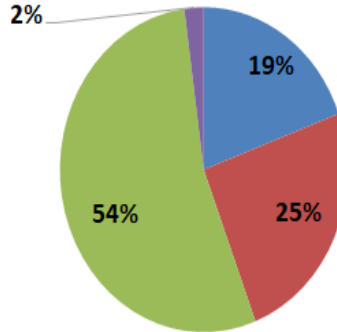


2018 MWh Output ^{2,3}

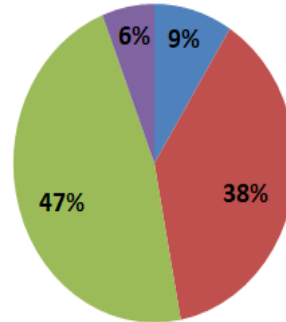


2030 MWh Output

Carolinas

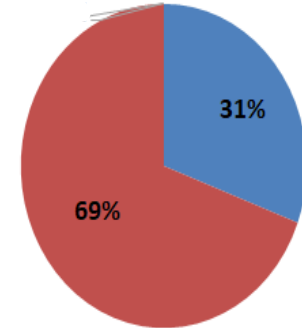


2018 MWh Output ^{2,3}

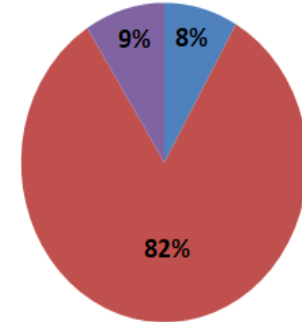


2030 MWh Output

Florida



2018 MWh Output ^{2,3}



2030 MWh Output

- Targeting 40 % reduction in CO₂ emissions by 2030 from 2005 levels¹
- Plan to retire additional ~ 1GW of coal by 2024

■ Coal/Oil ■ Natural Gas ■ Nuclear ■ Hydro, Wind & Solar



(1) 2030 carbon reduction influenced by customer demand, generation mix, weather, fuel availability and prices
 (2) 2018 data based on Duke's ownership share of U.S. generation assets as of 12/31/18
 (3) 2018 data excludes 8.519 GWh of purchased renewables, equivalent to ~4% of Duke's output

*Information above should not be relied on or used for any purpose

Challenges

1. Additional Gas Infrastructure
 - “Transitional Fuel”
2. Increased Fleet Flexibility
 - Renewables Driven
3. Coal Viability
 - Represents a substantial portion of capacity need
 - Fuel Diversity

Mitigation – Additional Pipeline Infrastructure

Project Scope:

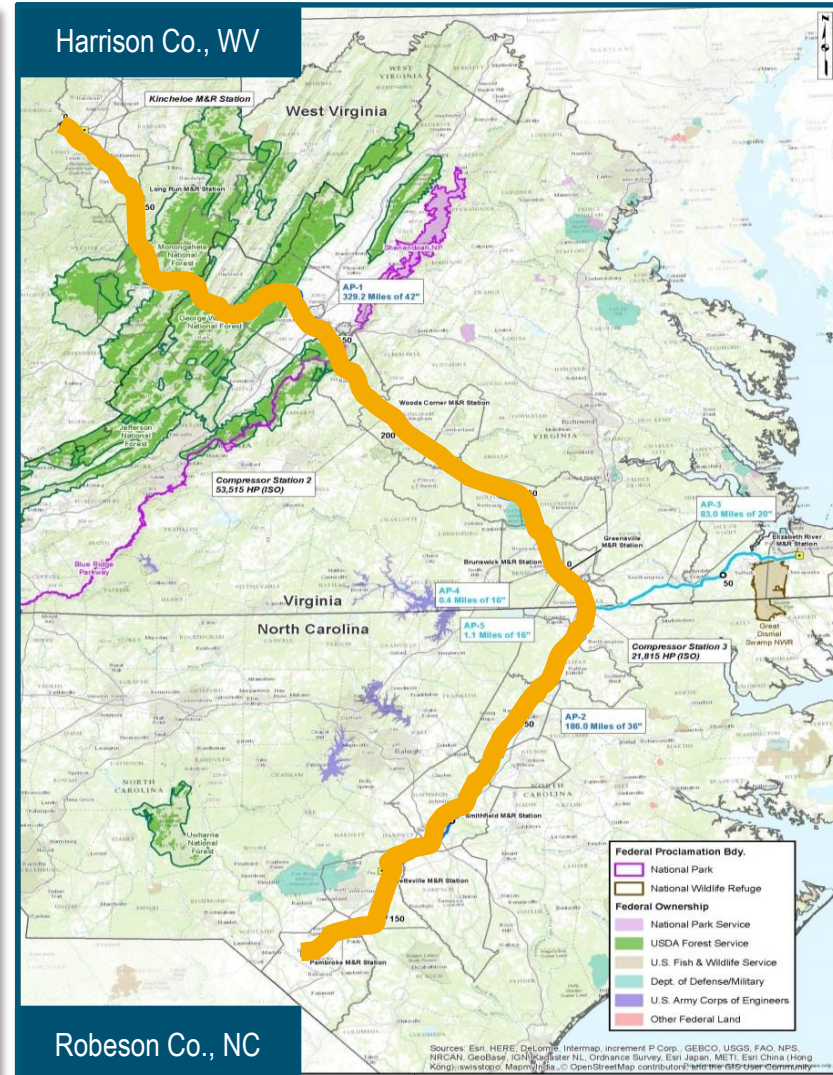
- ~600 mile FERC regulated pipe extending from Marcellus/Utica shale to VA and NC
- Initial pipeline capacity of 1.5 Bcf/day with potential expansion to 2 Bcf/day

Construction / Regulatory Update:

- On 5/9/19 the 4th Circuit Court heard oral arguments in regards to the stay of the Fish & Wildlife Service's re-authorized Biological Opinion ("BO") and Incidental Take Statement ("ITS"), it is expected that the court will issues its opinion on the stay by August
- Resolution of the Appalachian Trail and Blue Ridge Parkway crossings; per Dominion, targeting a filing with the Supreme Court in Q2-19
 - The U.S. Solicitor General (DOJ) filed a motion to join appeal

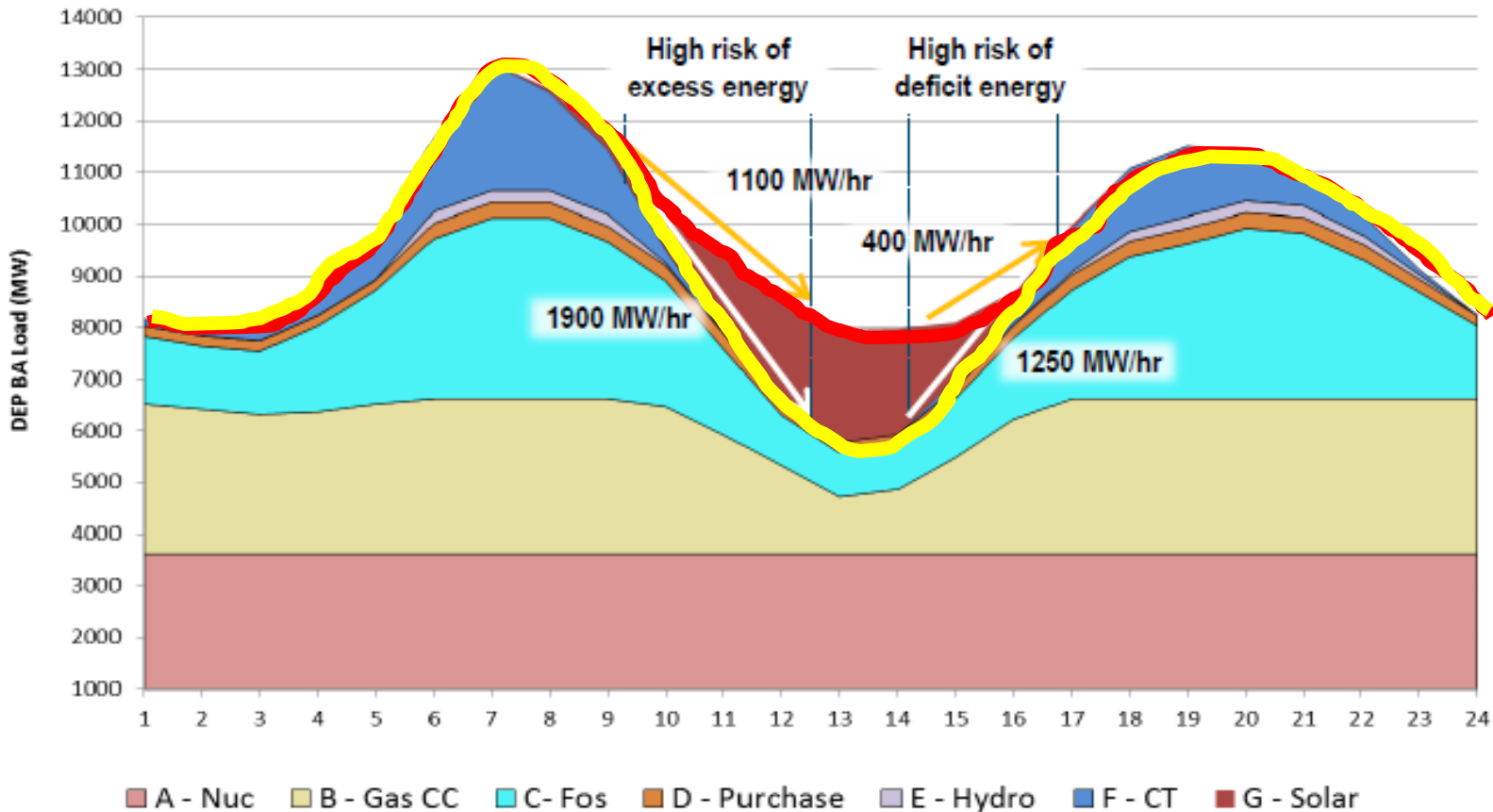
Target:

- ACP is pursuing late-2021 full in-service of entire project



Mitigation – Increased Fleet Flexibility

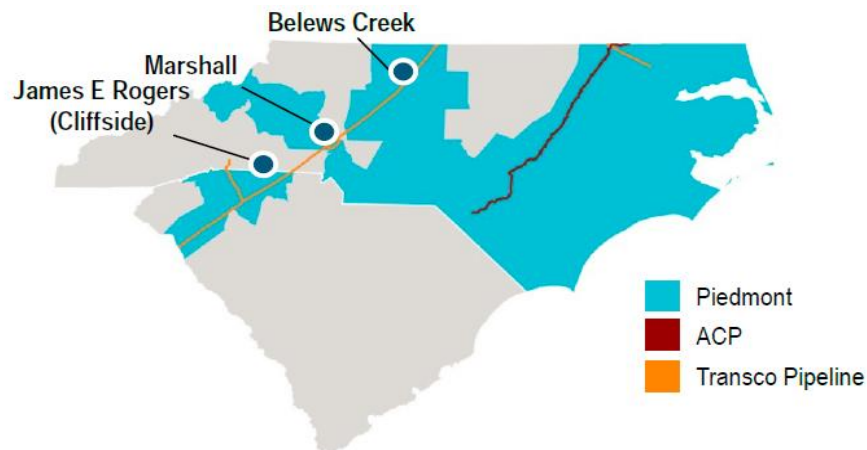
DEP Winter BA Load Shape (2200 MW Solar)



Mitigation – Increased Fleet Flexibility

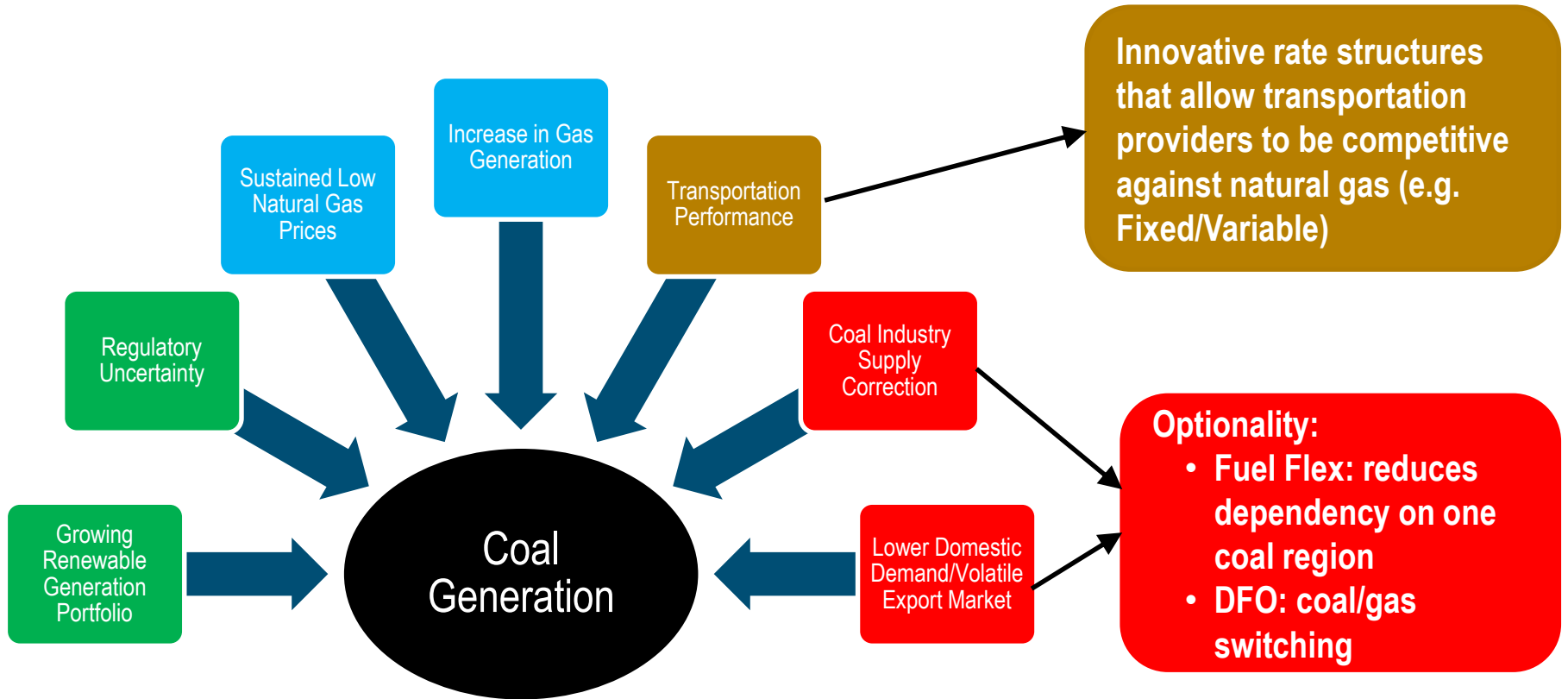
Duel Fuel Operation (DFO) Benefits

- Customer savings
- **Renewable Accommodation:** Improved ramp rates and lower minimum loads
- **Lower Emissions:** No Hg, SO₂, or Ash from gas. Lower NO_x & CO₂
- **Capitalize on optionality:** Hedge on gas / coal price while maintaining full coal operational capabilities for capacity certainty



Steam Unit	MW ¹	Vintage	Co-Fire %	LDC	DFO In-Service
Cliffside 5	544	1972	10-40%	PSNC	In-Service
Cliffside 6	844	2012	100%	PSNC	In-Service
Belews Creek 1	1,110	1974	50%	PNG	~Early 2020
Belews Creek 2	1,110	1975	50%	PNG	~Early 2021
Marshall 1	370	1965	10-40%	PNG	~Late 2021
Marshall 2	370	1966	10-40%	PNG	~Late 2021
Marshall 3	658	1969	50%	PNG	~Mid-to-Late 2020
Marshall 4	660	1970	50%	PNG	~Mid-to-Late 2020

Mitigation – Coal Viability



Key Take Aways

Targeting 40% reduction in CO₂ emissions by 2030 from 2005 levels¹

1. Natural gas consumption for generation is expected to continue to increase
 - Drivers: New gas generation / pipeline projects under development including:
 - Asheville CC (target in service late 2019)
 - Dual-fuel projects at Belews and Marshall;
 - Targeted in service of Q4 2021 of ACP which provides access to lower commodity cost gas
2. Renewable penetration expected to continue to increase
3. Despite lower coal generation expectations, coal capacity remains a critical part of Duke's capacity needs



Questions?