

# The Current State and Future of the US Nuclear Industry

Nima Ashkeboussi  
July 29, 2020



©2020 Nuclear Energy Institute





**THE NUCLEAR ENERGY INSTITUTE**  
is the **policy organization** of the nuclear  
technologies industry, based in  
Washington, D.C. On behalf of its  
members, NEI is the **unified voice** of  
the nuclear energy industry on various  
**policy** and **technical issues**.

**300+ MEMBERS IN 17 COUNTRIES**



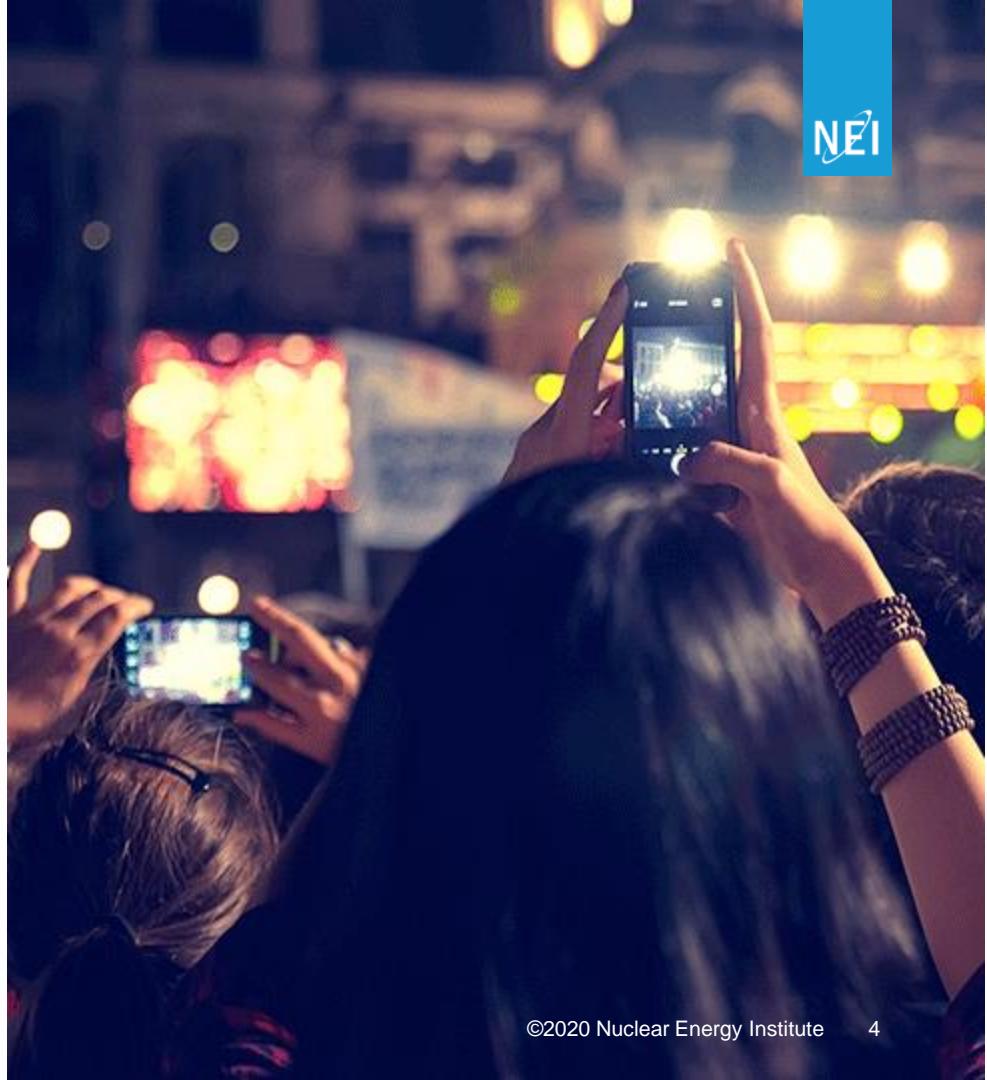
# Vision



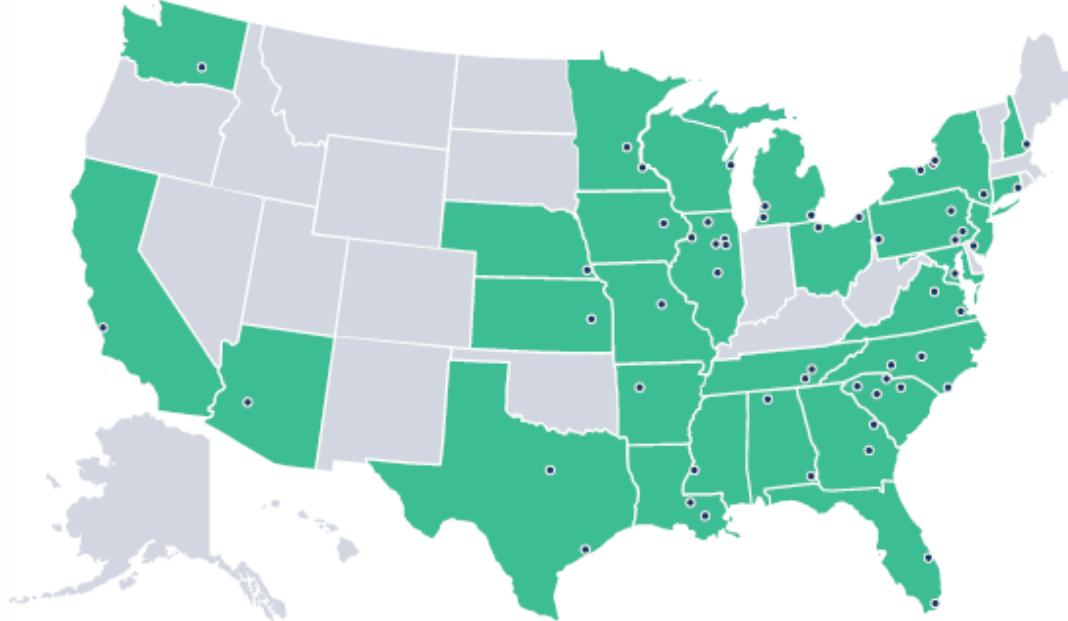
**A world powered by clean  
and reliable energy**

# Mission

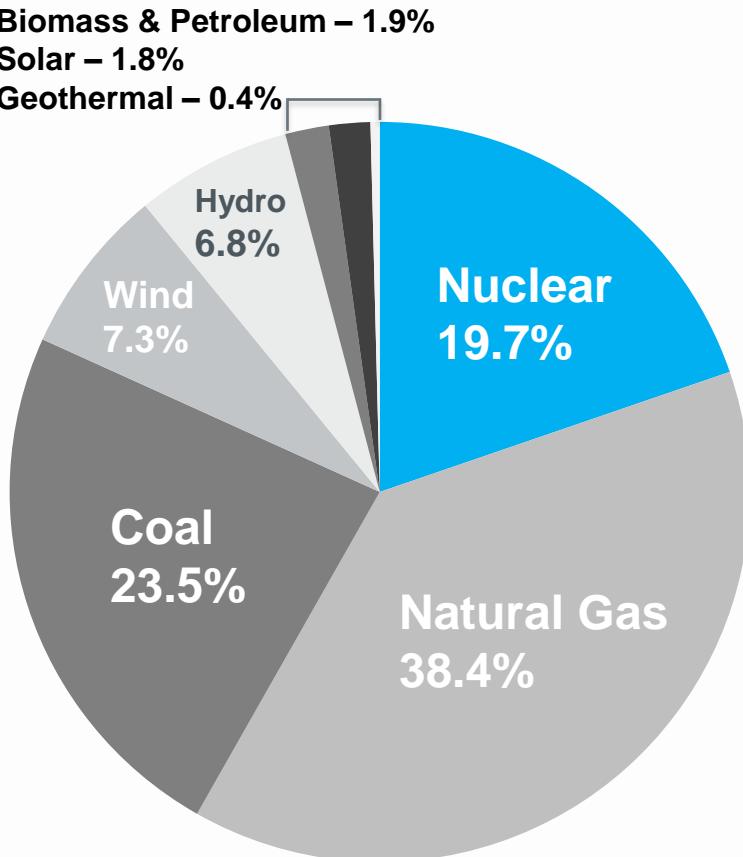
Promote the use and growth  
of nuclear energy through  
efficient operations and  
effective policy



# The U.S. Operating Fleet – 95 Reactors



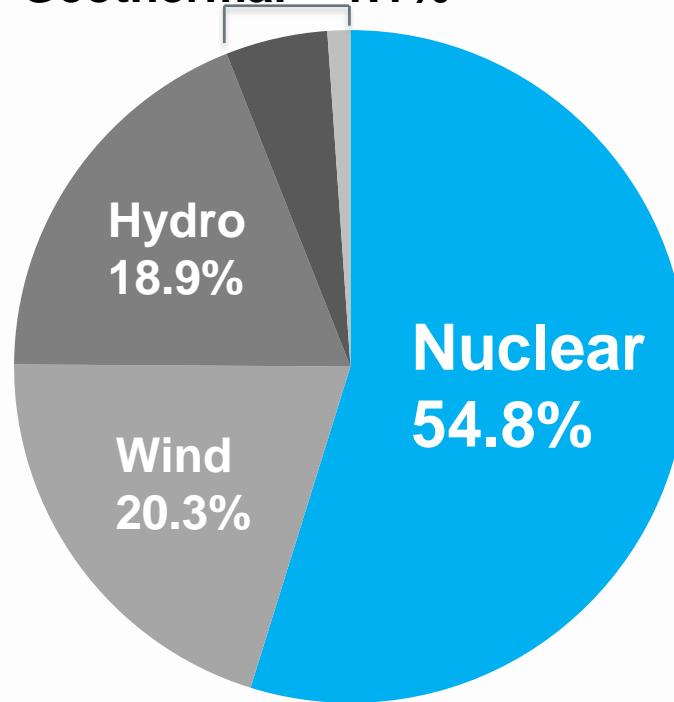
# Nuclear generates nearly 20% of U.S. electricity



# Nuclear supplies more than half of U.S. emissions-free electricity in 2019



Solar – 4.9%  
Geothermal – 1.1%



**Carbon-free generation increased  
by net 18.7 million MWh**

**TMI-1 and Pilgrim closure: future  
11.8 million MWh of annual  
carbon-free generation lost**

# Nuclear power breaks records in 2019



- **809.4 million MWh of electricity generated – highest ever**
- **93.4% capacity factor – highest ever**

NEI's capacity factor calculation (93.4%) accurately accounts for Three Mile Island I and Pilgrim generation in 2019.

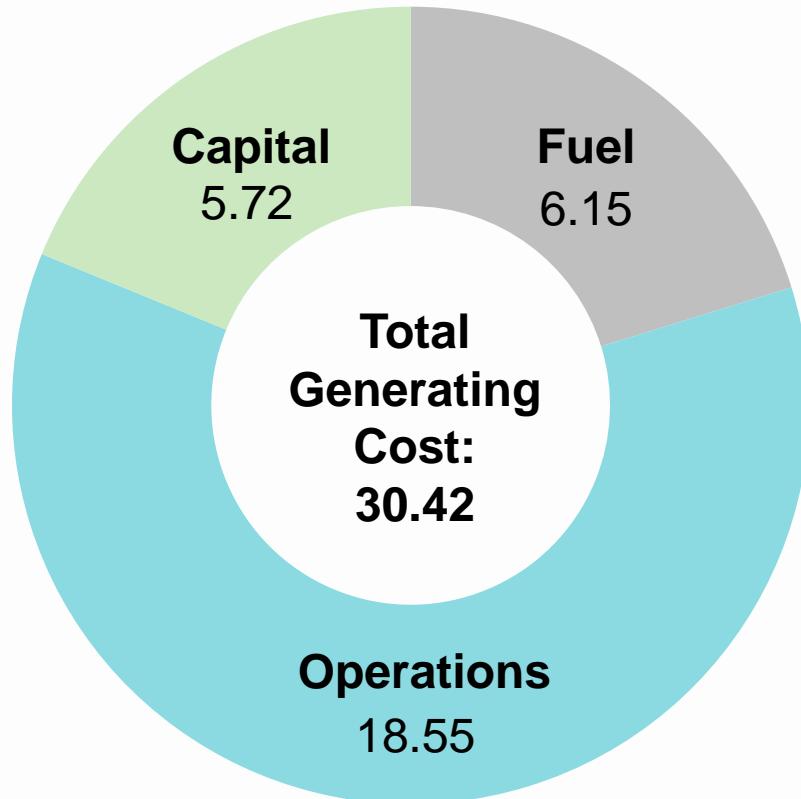
U.S. Energy Information Administration reports 93.5% as nuclear energy's capacity factor.

Source: U.S. Energy Information Administration

Updated: February 2020



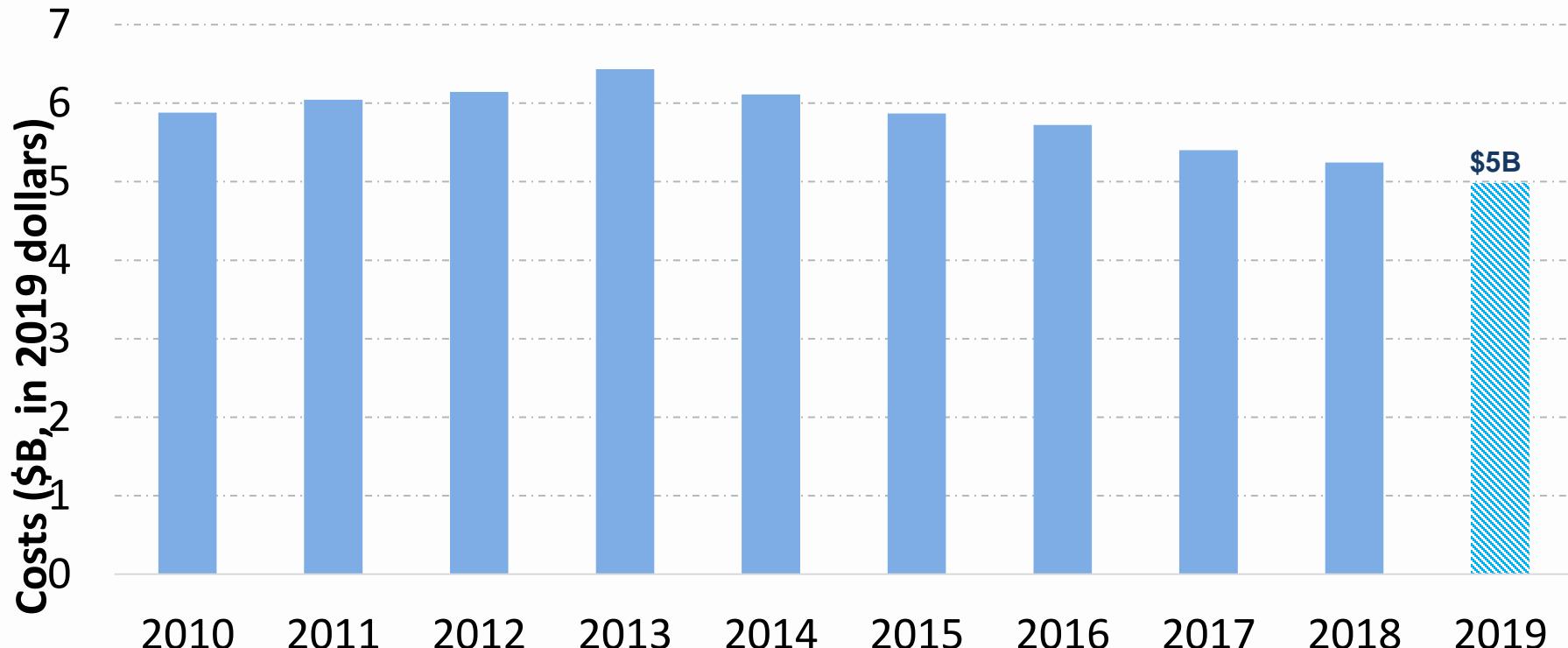
# 2019 total generating costs decreased nearly \$2.50/MWh



## 2019 costs compared to 2018:

- Total generating costs decreased by **\$2.49/MWh (7.6% reduction)**
- Operations costs decreased by **\$1.57/MWh (7.8% reduction)**
- Capital costs decreased by **\$0.60/MWh (9.5% reduction)**
- Fuel costs decreased by **\$0.32/MWh (4.9% reduction)**

# Fuel costs are stable over the last decade



# U.S. nuclear plants reduced costs by nearly 32% since 2012



Year	Fuel	Capital	Operating	Total Generating
2002	6.18	4.23	20.08	30.50
2004	5.70	6.10	20.02	31.82
2007	5.54	6.61	20.59	32.73
2010	7.29	10.09	22.46	39.83
2011	7.64	11.02	23.81	42.47
2012	7.97	12.19	24.41	44.57
2015	7.37	8.60	22.49	38.45
2016	7.16	7.18	21.76	36.11
2017	6.71	6.92	21.39	35.03
2018	6.47	6.32	20.12	32.91
2019	6.15	5.72	18.55	30.42
<b>2018 – 2019 Change</b>	<b>-4.9%</b>	<b>-9.5%</b>	<b>-7.8%</b>	<b>-7.6%</b>
<b>2012 – 2019 Change</b>	<b>-22.7%</b>	<b>-53.1%</b>	<b>-24.0%</b>	<b>-31.7%</b>

Costs in 2019 dollars

# 5 announced, 10 prematurely closed reactors since 2013



Plant / Site	State	Capacity (MWe)	Closure Year	Latest Year Generation (billion kWh per year)	Latest Year CO <sub>2</sub> Avoided (Million metric tons per year)
Crystal River 3	Florida	838	2013	7.0	4.8
San Onofre 2 & 3	California	2,150	2013	18.1	8.0
Kewaunee	Wisconsin	566	2013	4.5	4.4
Vermont Yankee	Vermont	604	2014	5.1	2.5
Fort Calhoun	Nebraska	478	2016	3.5	3.4
Oyster Creek	New Jersey	608	2018	5.4	3.9
Pilgrim	Massachusetts	679	2019	4.4	2.0
Three Mile Island 1	Pennsylvania	803	2019	7.3	5.0
Indian Point 2	New York	1,016	2020	8.4	3.8
<b>TOTAL</b>		<b>7,742</b>		<b>63.8</b>	<b>37.8</b>
Duane Arnold	Iowa	601	2020	5.2	4.6
Indian Point 3	New York	1,038	2021	8.3	3.8
Palisades	Michigan	772	2022	6.9	5.3
Diablo Canyon 1 & 2	California	2,240	2024-2025	16.2	6.5
<b>TOTAL</b>		<b>4,651</b>		<b>36.6</b>	<b>20.1</b>

# Policies Do Not Value Attributes Safe, Reliable Electricity 24/7, Plus ...



# More than 9,100 direct jobs saved from state actions



Plant / Site	State	Summer Capacity (MWe)	Initially Announced Closure Year	Electricity Generated (billion kWh in 2019)	CO <sub>2</sub> Emissions Avoided (Million metric tons per in 2019)
Beaver Valley 1 & 2	Pennsylvania	1,808	2021	15.5	9.5
Clinton	Illinois	1,065	2017	8.4	7.6
Davis-Besse	Ohio	894	2020	7.8	4.8
FitzPatrick	New York	848	2017	7.4	3.3
Ginna	New York	582	2017	5.0	2.2
Hope Creek & Salem 1 & 2	New Jersey	3,500	~2020-2021	26.6	16.3
Millstone 2 & 3	Connecticut	2,073	~2020	16.7	7.1
Nine Mile Point 1 & 2	New York	1,917	2017-2018	15.8	7.1
Perry	Ohio	1,240	2020	9.2	5.6
Quad Cities 1 & 2	Illinois	1,819	2018	15.5	9.5
<b>TOTAL</b>		<b>15,746</b>		<b>127.9</b>	<b>73.1</b>

This is nearly twice the electricity generation by all solar in the U.S. in 2019.

# Key Principles For Communicating About Nuclear



## Associate

Nuclear with wind and solar and a carbon-free future

## Amplify

Nuclear's benefits, focusing on its role as a carbon-free energy source

### Elevate, Don't Denigrate:

- Messages that focus on positive connections between nuclear and renewables outperform negative messages

### Better Together:

- Nuclear is stronger as a complement to wind and solar than as a standalone energy source

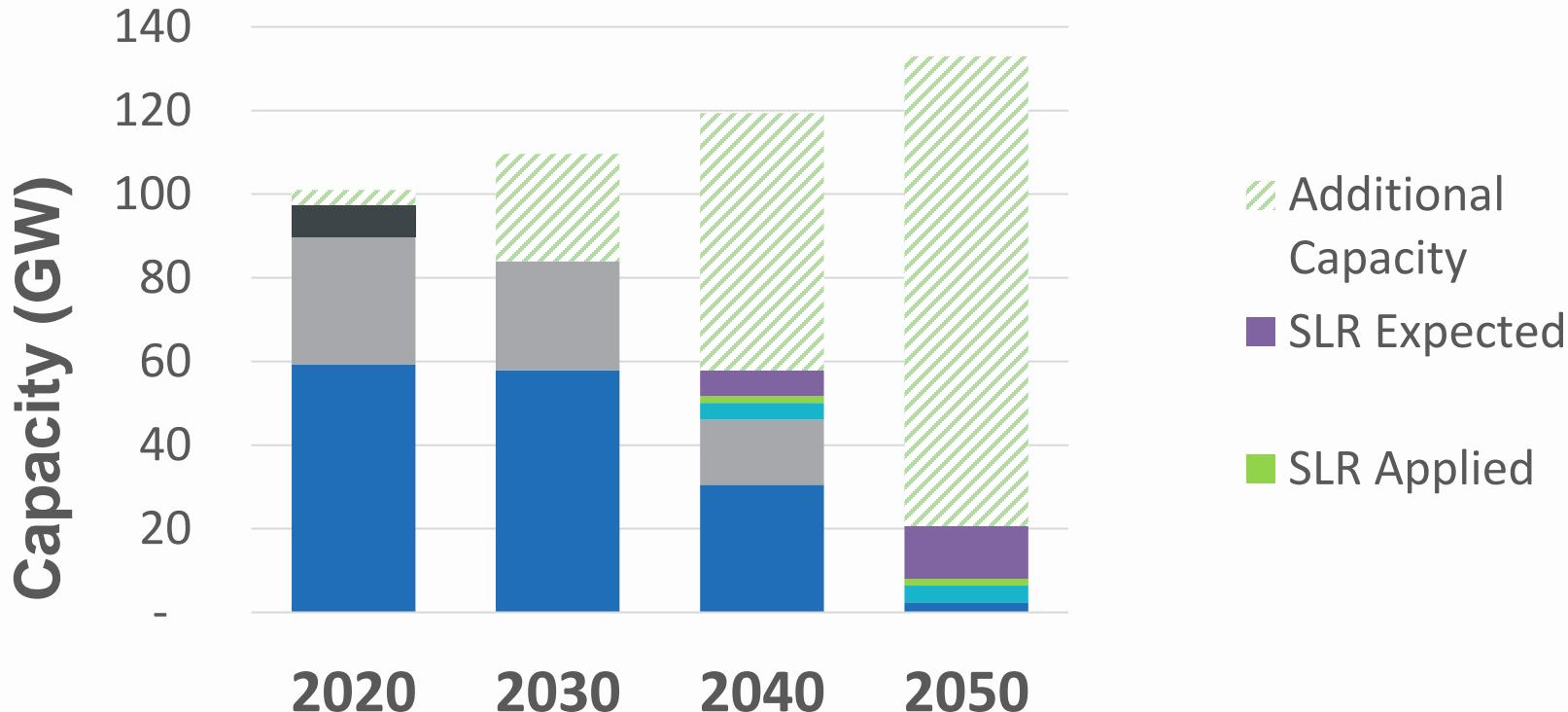
### Reliable + Carbon-free

- Nuclear's role helping to create a carbon-free future by serving as the largest 24/7/365 carbon-free energy source
- Nuclear's opportunity to innovate in ways that bring a cleaner future

**Wind, solar, and nuclear energy  
are a balanced mix that will get us to  
a carbon-free future.**



# Maintaining 20% market share requires adding over 112 GW



# Growth from efficiency improvements and uprates are equivalent to 32 new 1,000 megawatt power plants

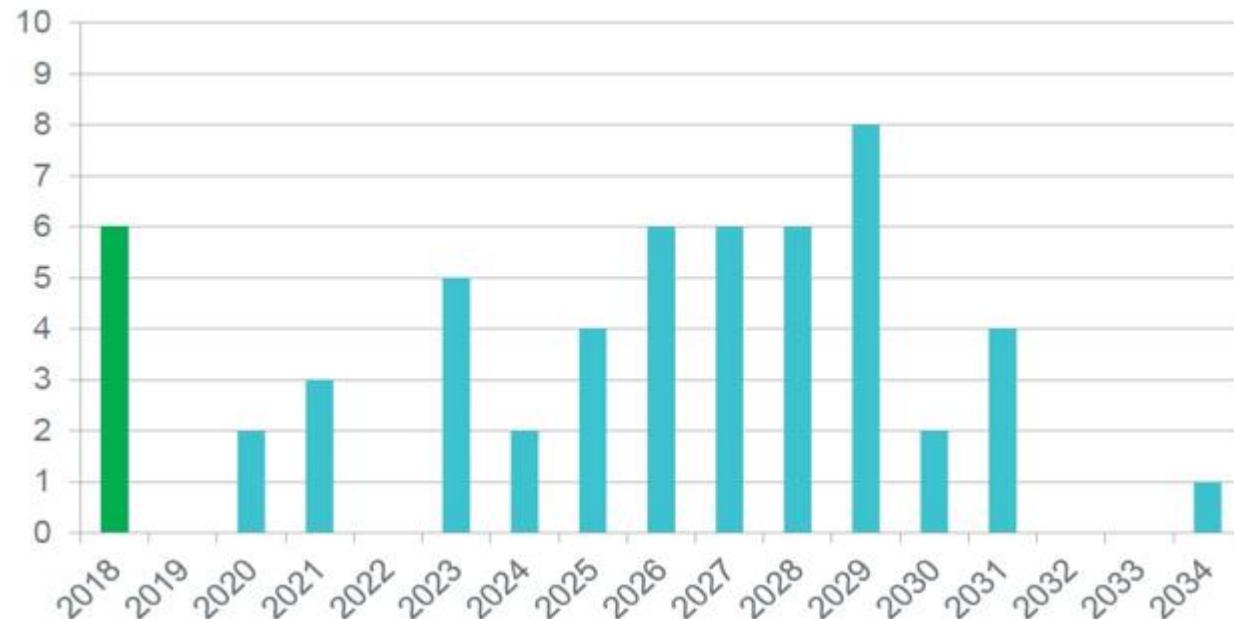


Source: Emissions avoided are calculated using regional and national fossil fuel emissions rates from the **U.S. Environmental Protection Agency** and plant generation data from the **U.S. Energy Information Administration**.  
Updated: March 2020

# Second License Renewal Survey



49 more units forecasted



# Vogtle 3 & 4 Construction

NEI



Vogtle units 3 (left) and 4 (right)

June 2020

©2020 Georgia Power Company All rights reserved.

# SMR & Advanced Reactors Under Review

NEI



# The End Game

## Educate

- Carbon-free
- 24/7/365
- Wind+Solar +Nuclear

## Policy

- Carbon-free Legislation
- Regulation

## Advocate

- Third Parties
- Media

## Outcomes

- Preserve Current Fleet
- SLR
- Carbon-free Commitments
- New nuclear
- Enhance Reputation