

# *Pathways to Clean Energy Future*

Christine King

Director, Gateway for Accelerated Innovation in Nuclear

[christine.king@inl.gov](mailto:christine.king@inl.gov)

Mobile 650-283-4235

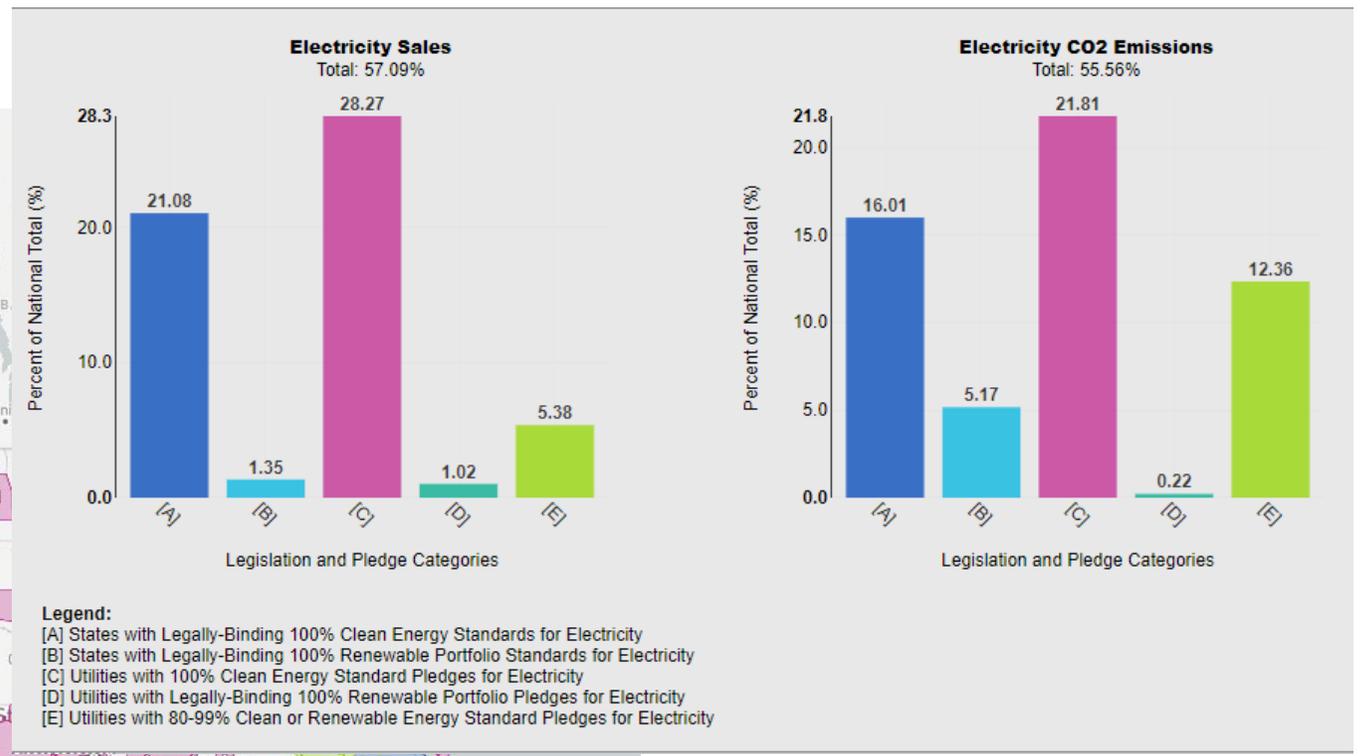
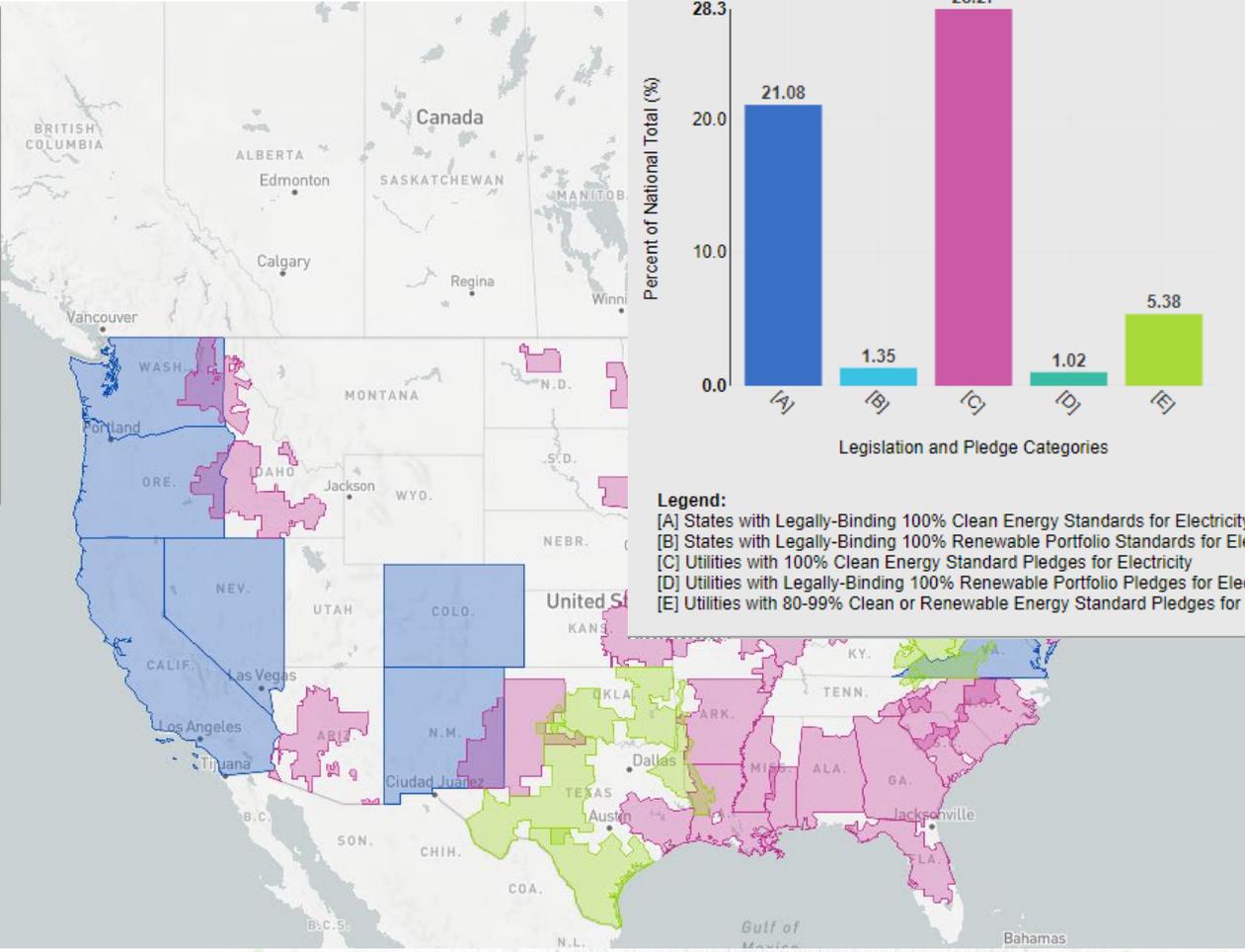
October 12, 2021

Molten Salt Reactor Workshop

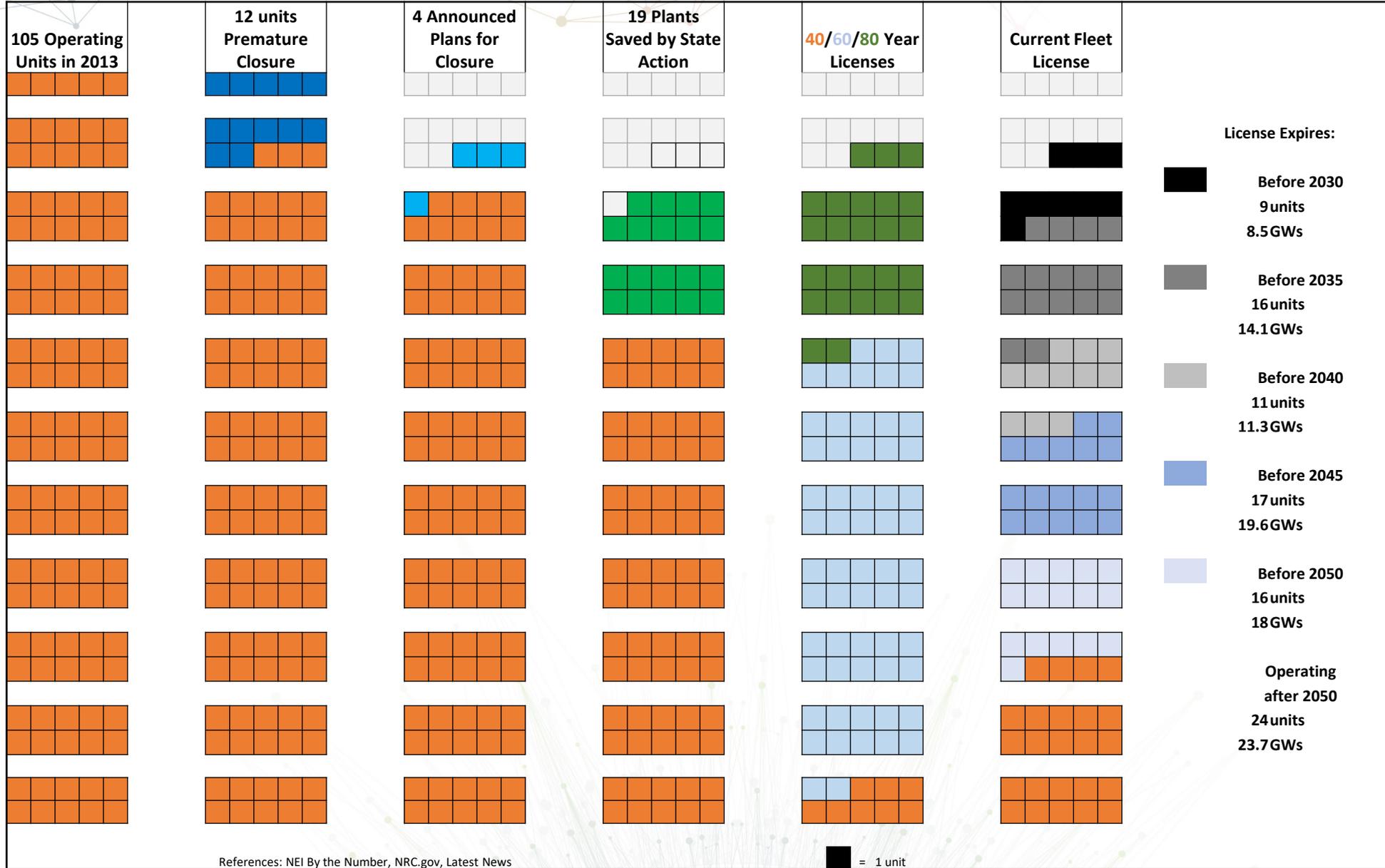


# US Decarbonization Targets – Electricity <100%

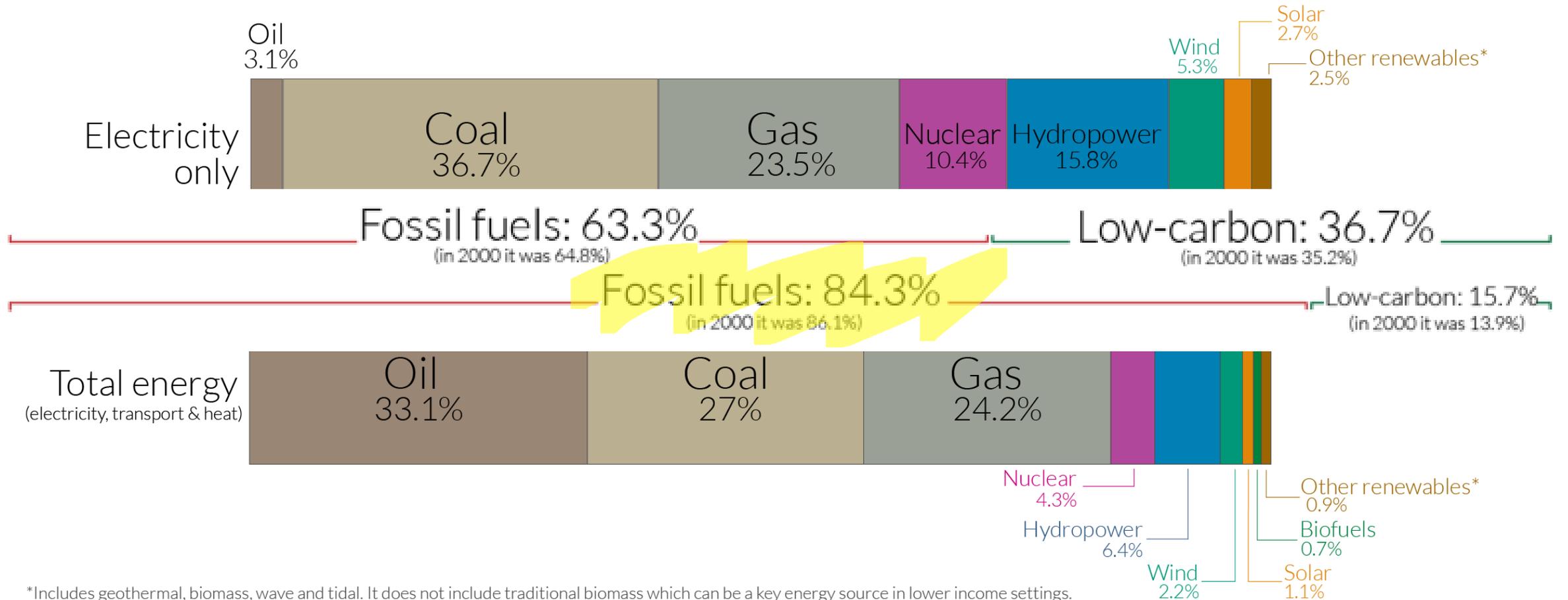
Electricity Standards/Pledges	
<span style="color: blue;">■</span>	States with Legally Binding 100% Clean Energy Standards for Electricity
<span style="color: cyan;">■</span>	States with Legally Binding 100% Renewable Portfolio Standards for Electricity
<span style="color: magenta;">■</span>	Utilities with 100% Clean Energy Standards for Electricity
<span style="color: teal;">■</span>	Utilities with 100% Renewable Portfolio Standards for Electricity
<span style="color: lime;">■</span>	Utilities with 80-99% Clean Energy or Renewable Portfolio Standards for Electricity



# Existing Nuclear Fleet



# More than one-third of global electricity comes from low-carbon sources; but a lot less of total energy does



\*Includes geothermal, biomass, wave and tidal. It does not include traditional biomass which can be a key energy source in lower income settings.

# Deployment Constraints May Determine Future Energy Mix

Primary Energy Source	Key Deployment Challenges	2050 Build-out Across the Range of Modeling Scenarios
Renewables	Resource availability, siting, social license, and transmission requirements	1,700 – 5,500 gigawatts
Nuclear	Commercial status of new technology, ability to rapidly scale deployment in light of siting challenges and complex regulatory requirements, socio-political acceptance, and need for resolution of waste disposal issue	11 – 113 gigawatts
Gas	Need to limit methane emissions from extraction, address local environmental impact, social license, infrastructure and other constraints on CO2 injection rate for geologic sequestration	0 – 30 trillion cubic feet
Biomass	Limits on feedstock types and volumes that can be considered carbon-neutral	350 – 700 million metric dry tons

## PATHWAYS TO NET-ZERO EMISSIONS

Decarb America Research Initiative  
Key Takeaways

FEBRUARY 4, 2021

# Advanced Nuclear Industry Milestones in New Website



## TerraPower announces SMR proj...

DATE

6/2/2021

DESCRIPTION

Wyoming Governor Mark Gordon announced that TerraPower and PacifiCorp will be working together to demonstrate TerraPower's Natrium small modular react...

WEB RESOURCES

TerraPower, Wyoming Governor and PacifiCo



## Montana relaxes nuclear constru...

DATE

4/30/2021

DESCRIPTION

Signed by Governor Greg Gianforte in Spring of 2021, HB 273 grants the Montana State Legislature with the authority to approve the construction of new nuclear ...

WEB RESOURCES

HB 273: Eliminate Restrictions on Nuclear Fa



## NJBPU extends nuclear ZECs for t...

DATE

4/27/2021

DESCRIPTION

In a unanimous vote, the New Jersey Board of Public Utilities (NJBPU) extended the ZEC credits for PSEG and Exelon's nuclear plants for an additional three years. PSEG owns t...

WEB RESOURCES

New Jersey Regulators Extend Nuclear Subs



**MARVEL**

## MARVEL is approved

DATE

4/13/2021

DESCRIPTION

As part of the Department of Energy's (DOE) Microreactor Program, the Microreactor Applications and Research Validation and Evaluation (MARVEL) Project will be house...

WEB RESOURCES

INL's MARVEL could demonstrate remote op

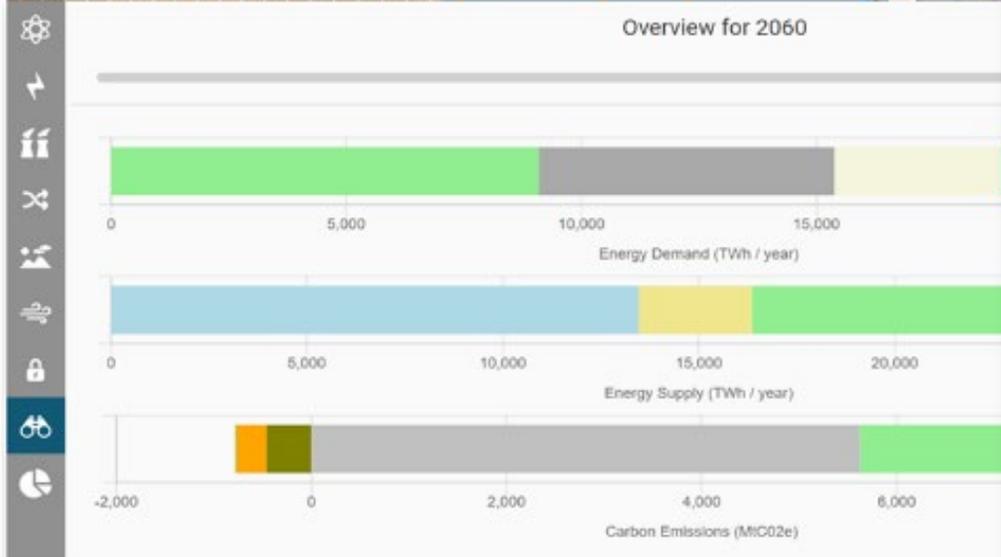
The new website captures key industry achievements in technology, development, policy, regulation, finance, integrated systems.

<https://www.airtable.com/universe/expnrIMohdf6dlvZI/milestones-in-advanced-nuclear?explore=true>

# GAIN Energy Calculator

The GAIN Energy Calculator is available at <https://gain.ornl.gov/#/>.

SELECTED: US **Total CO<sub>2</sub> Reduction (target: 100%)**



**DEMAND - BUSINESS (7)**

Growth in industry A ?

US industry output grows by 1% every year.

Energy intensity of industry A ?

No electrification of processes; little improvement in reducing energy intensity

Commercial demand for heating and cooling 1 ?

Space heating demand, hot water demand, and cooling demand increased by 3% every 5 years

Commercial heating electrification A ?

The proportion of non-domestic heat supplied using electricity is 0-10%, as today

Commercial heating that isn't electric 1 ?

The dominant non-electric heat source is gas or gas CHP (biogas if available)

**SUPPLY - ELECTRICITY GENERATION (14)**

Nuclear power stations 1 ?

No new nuclear energy

CCS power stations 1 ?

Demonstration plants only; no roll-out of CCS

CCS fuel mix 1 ?

Current fraction (38% Coal, 62% Natural gas)

Offshore wind 1 ?

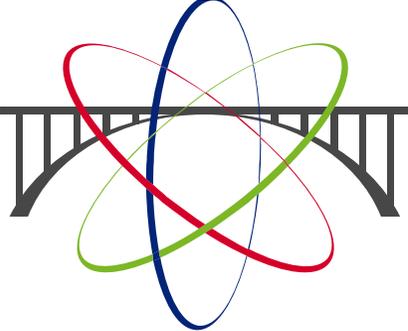
No offshore wind

Onshore wind 1 ?

Follow current regional trajectory

Wave JK ?

None in 2060



# **GAIN**

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