

# CARBON FREE

## TECHNOLOGY INITIATIVE

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We believe we can meet the challenge of addressing climate change and develop the carbon-free technologies that will help the world meet this challenge.



# Overview:

- Background and motivation of the Carbon-Free Technology Initiative
- The need for dispatchable zero carbon power to meet climate goals
- Summary of innovation recommendations
- The recommendations in context

# Why the Carbon-Free Technology Initiative?

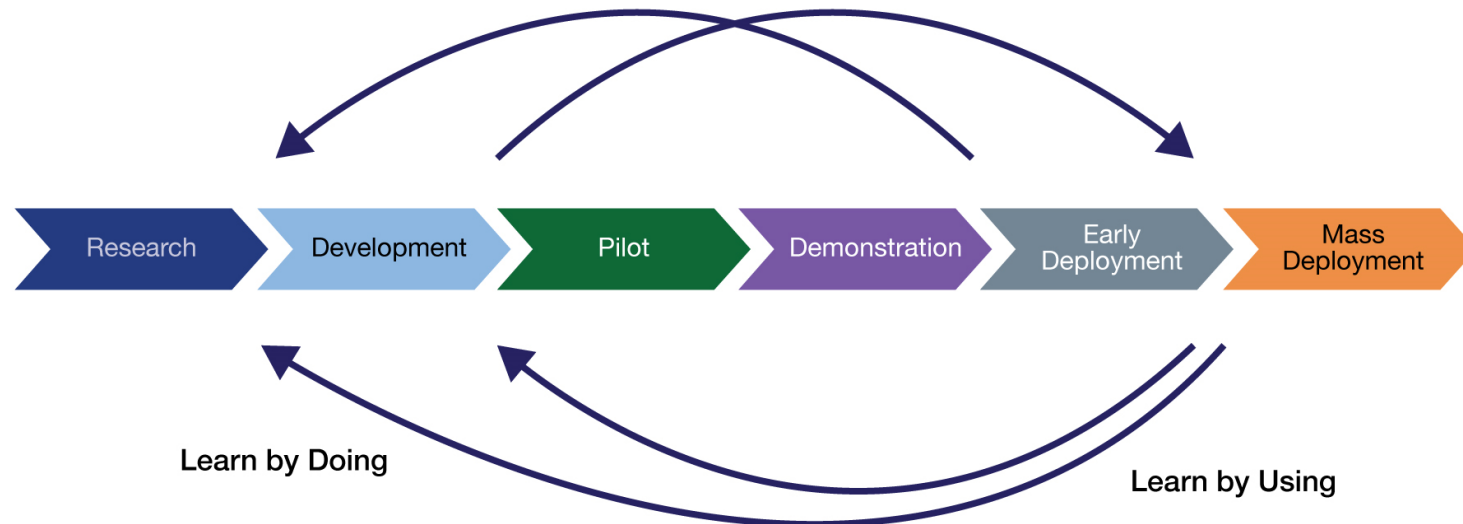
- To date, **50 EEI members** have announced long-term carbon reduction goals.
- **Forty EEI member companies have pledged to achieve zero- or net-zero carbon emissions** by mid-century or earlier.
- To meet these pledges, firm, dispatchable, zero-carbon resources are needed by the early 2030s.
- The Carbon-Free Technology Initiative (CFTI) **promotes federal policies** that can help ensure the commercial availability of affordable, carbon-free, 24/7 power technologies by the **early 2030s**.
- If the CFTI is successful, the electric power industry could be positioned to achieve a mid-century net-zero target and support decarbonization of other sectors, such as transportation and industry.

# Overview of Recommendations

- **The CFTI focuses on policy recommendations to advance six key technology areas:**
  - **Advanced renewables**, seeking increased output and efficiency from variable sources, including advanced power electronics to improve grid management of variable generation
  - Deployment of **new dispatchable resources** (e.g., superhot rock deep geothermal)
  - Medium-duration and long-duration **storage and advanced demand efficiency**
  - **Zero-carbon fuels**, such as hydrogen, produced from carbon-free pathways
  - **Advanced nuclear energy** (both fission and fusion)
  - And **carbon capture, utilization, and sequestration**, especially for natural gas power generation facilities

# Scope of recommendations: covering the full innovation lifecycle

- A successful technology innovation strategy should focus on early-stage research through later-stage deployment. Without consideration of the full lifecycle, large technology and financing risks deter marketplace adoption. Moreover, **each segment of the innovation lifecycle is not isolated – the successes and failures from each step inform others.** The figure below illustrates the common feed-back and pass-forward lessons learned from different stages of the innovation lifecycle.



# Federal government support needed at various stages

**Research** – where discovery and invention happen. Federal support for research (both basic and applied) at national labs and universities is necessary to address the market failure to adequately price the benefits of future technology deployment.

**Development** – where scientific discoveries are turned into new technologies and applications. Federal programs like the Department of Energy’s Advanced Research Project Agency – Energy (ARPA-E) and technology offices help address development risks.

**Pilot** – where small-scale (i.e., not the commercial product) fully integrated systems are created as a technological proof of concept, resulting in important technology de-risking. ARPA-E has expanded support to this stage through its new SCALEUP program.

**Demonstration** – where fully integrated “first-of-a-kind” projects are done on a commercial scale. Private sector involvement is crucial, and these projects must be led by the private sector. But high costs of capital, with remaining technology and project risks, can be alleviated by federal support through direct grants, loan guarantees, technological assistance, and procurement incentives.

**Early Deployment** – where early “Nth-of-a-kind” projects are done, with an emphasis on improving financing options and driving down costs through multiple iterations of same/similar design. The federal government can help by off-setting technology risk and creating markets, either through direct procurement or tax incentives, to build momentum for more projects being built in the future.

**Mass Deployment** – where technological and financial mechanisms have been fine-tuned and projects are developed profitably in response to market demand. The federal government can create predictable markets that incentivize mass deployment, if there is clear public benefit. Financing and procurement support can help accelerate the deployment of new technologies thus driving costs down more quickly.

# Overview of Recommendations:

- Research and development
- Commercial demonstration
- Scale-up and diffusion
- Deployment and infrastructure

# Research and development

- Most federal support for clean energy R&D occurs through the Department of Energy (DOE). Regarding R&D for carbon-free technologies, proposed policy recommendations would:
  - **Significantly increase funding for energy innovation R&D programs at DOE over the next five years**, including through ARPA-E and national laboratories. Such funding should continue to increase after the initial five-year period.
  - Create dedicated programs and initiatives at DOE for each of the technology areas to **accelerate their development and establish new mechanisms for public and private-sector** collaboration, including with state and local entities.
  - Revise the focus of the DOE Office of Fossil Energy to highlight carbon capture for natural gas generation.
  - Launch a Nuclear Affordability Initiative that would direct DOE to **emphasize reducing the cost and schedule to construct new nuclear plants** and reduce the operation and maintenance costs for those new plants.



# Commercial demonstration

- **Enabling projects to quickly move from R&D and pilot demonstration toward commercial-scale demonstration is essential.** Demonstration projects face several hurdles, including limited appetite by private investors and federal efforts suffering from limited funding and limited risk appetite. To overcome these hurdles, proposed policy recommendations would:
  - Establish a dedicated program to guide and support the demonstration of the priority technologies noted above.
  - Establish consortia with collaboration and knowledge-sharing across federal agencies, the national labs, and non-governmental and other entities with relevant expertise.
  - Adopt measures to reduce barriers to using loan guarantees offered by the DOE Loan Program Office.
  - Establish alternative cost-share formulas for demonstration projects not necessarily tied to a 50/50 split (e.g., for early-stage project development, an 80/20 cost-share grant program would be appropriate).
  - Increase appropriations to support commercial-scale demonstration projects involving first-of-a-kind and Nth-of-a-kind technologies.

# Scale up and widespread diffusion (1)

- **A range of mechanisms are needed to support carbon-free technologies** to move from the demonstration stage to achieving technical maturation at a commercial scale and relative competitiveness in the marketplace. Policy recommendations with respect to the deployment of carbon-free technologies would:
  - Provide financial incentives for investing in deployment of these technologies, including production or investment tax credits (with monetization), loan guarantees, and grants.
  - Extend and expand existing tax credits, such as 45Q for carbon sequestration.
  - Develop a technology-neutral tax credit to incentivize deployment of new carbon-free technologies.
  - Authorize the federal government to offer a contract for difference mechanism that buffers the technology against downside market risk while sharing upside profits with taxpayers.

## Scale up and widespread diffusion (2)

- Proposed policy recommendations with respect to the deployment of carbon-free technologies would also:
  - Utilize federal government virtual power purchase agreements of 10-30 years for some carbon-free energy technologies.
  - Establish enterprise zones for power plant sites that are closing to encourage deployment of new carbon-free energy technologies in those zones.
  - Establish a federal clean energy fund that would invest in, as well as spur private investment into, carbon-free energy technologies.

# Deployment and infrastructure

- **Achieving net-zero carbon emissions from the electric power sector will require substantial infrastructure investments.** This will require both the ability to permit and site (1) generating facilities and (2) the supporting infrastructure, such as transmission, natural gas pipelines and storage that enables their operation. Proposed policy recommendations to address these “ecosystem” issues would:
  - Address siting barriers to construction of clean energy generation, transmission, and CO<sub>2</sub> pipelines.
  - Reform siting and permitting on federal lands.
  - Provide federal support mechanisms for licensing carbon-free energy technologies, such as advanced nuclear facilities by the Nuclear Regulatory Commission.
  - Establish industry consortia for broader deployment and use of carbon-free energy technologies across industries.

# CFTI Workgroup Process and Overview

Thank you

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