



Advanced Nuclear Energy

By Matt Bishop

As the energy industry diversifies and demand to decarbonize the economy increases, interest in nuclear energy has increased in recent years. Any future nuclear energy development will involve next generation technology, which differs from traditional nuclear energy projects. This issue brief discusses the role of nuclear power in Colorado energy policy, advances in nuclear energy technology, and factors that may impact future policy decisions.

Nuclear Energy in Colorado

While there are 54 nuclear power plants operating in 28 U.S. states, almost all are located in the Eastern U.S. or the Midwest, and there are none in Colorado. The state's only nuclear power plant was decommissioned in 1989, and repurposed into a natural gas gas power plant in 1996.

Under current law, the Colorado Energy Office (CEO) must evaluate advanced nuclear energy among a selection of "cleaner energy sources."¹ Recent legislation requires CEO to study opportunities for new

energy resources in specific, rural parts of Colorado, including nuclear energy.²

Although nuclear energy has a low carbon footprint,³ it is not a renewable energy source and is excluded from policies that affect renewable energy, including the state's Renewable Energy Standard, which sets targets for energy generation from certain sources;⁴ renewable energy cooperatives;⁵ and public land leases for renewable energy generation.⁶

Advanced Nuclear Technology

Nuclear power plants are major infrastructure investments with long lifespans. While they can be updated, many technological advancements will primarily benefit the next generation of power plants. According to the U.S. Department of Energy, new technologies can increase safety while reducing radioactive waste and capital costs. These include built-in safety mechanisms to mitigate accidents and accommodate longer response times if accidents do occur.

¹ Section 24-38.5-102(1)(a)(v), C.R.S.

² [House Bill 23-1247](#)

³ [Nuclear energy provides about as much energy in the U.S. as all renewable sources combined.](#)

⁴ Section 40-2-124(1)(a), C.R.S.

⁵ Section 7-56-210, C.R.S.

⁶ Section 36-1-147.5, C.R.S.

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Small Modular Reactors

Nuclear reactors operating in the U.S. range in capacity from about 500 MW to 1,400 MW, with an average of about 1,000 MW. Small modular reactors (SMRs) are a kind of advanced nuclear reactor currently in development. They have a capacity of up to 300 MW and many of their components can be factory-built. This allows SMRs to operate on sites unsuitable for larger, traditional reactors and in more remote locations. In addition to the safety benefits of other advanced reactors, SMRs require less frequent refueling, which improves efficiency by decreasing downtime. Their siting flexibility allows them to be built at decommissioned coal or natural gas power plants, further decreasing capital costs.

Policy Considerations

Advanced nuclear technologies offer benefits compared to traditional nuclear reactors. Simultaneously, some concerns about the use of nuclear technology remain.

Economic Impact

The ability to site SMRs at decommissioned fossil fuel plants lowers capital costs and creates opportunities for workforce development including retraining within the energy sector. Nuclear energy is well suited for the nascent hydrogen market.⁷

⁷ [U.S. Department of Energy](#)

⁸ [National Renewable Energy Laboratory](#)

Climate Impact

Nuclear power plants emit no greenhouse gases as a byproduct of energy generation. While upfront development and fuel extraction do generate greenhouse gases via construction, mining, and transportation, nuclear energy's lifecycle impact remains competitive with renewable sources.⁸ Since nuclear energy can serve as baseload power, it may be a low-emissions substitute for retiring fossil fuel power plants.

Nuclear Waste

Generating nuclear energy produces radioactive waste as a byproduct, which remains dangerous for thousands of years. Despite decades of work, the U.S. lacks a permanent, national nuclear waste storage site. Currently, spent nuclear fuel is housed on-site at nuclear power plants. A recent bill proposes establishing a new federal agency to manage nuclear waste.⁹

Risk of Nuclear Accidents

The U.S. Nuclear Regulatory Commission provides safety, security, and environmental oversight over nuclear power plants. Advanced nuclear technologies include safety features that mitigate the risk of accidents occurring. Although rare, nuclear accidents can be highly impactful, and their high-profile nature erodes public trust.

⁹ [Nuclear Waste Administration Act of 2024](#)