BASELOAD GENERATION

National Electrical Manufacturers Association

Baseload generation provides electricity to the grid to meet the around-the-clock power needs of the U.S. The grid is powered by a variety of baseload generation, including **coal-fired power plants, natural gas combined cycle plants, nuclear plants, hydropower plants, and geothermal plants.**

Key Technologies

Utility scale baseload generation includes **commercial nuclear reactors, super critical pulverized coal fired power units, and combined cycle natural gas plants**. Coal and natural gas power plants account for 98% of the U.S. power sector GHG emissions.[1] **Carbon capture, utilization, and storage (CCUS)** can be deployed to decarbonize coal and natural gas plants. **Small modular nuclear reactors** (SMRs), **micro-hydropower systems, hydroelectric re-powering, long duration energy storage** and **enhanced geothermal systems** (EGS) will also be needed to create zero emissions baseload generation.

Potential Market Size & Timing

The U.S. has set an overall goal of decarbonizing the generation of electricity by 2035, as part of the target to reach net zero emissions economy-wide by 2050.[2] With coal and natural gas plants currently generating 60% of the U.S. power supply (or 1,675 billion kWh),[3] the transition to a decarbonized grid will create an enormous market opportunity for zero carbon solutions that create clean, firm, baseload power. The DOE Renewable Lab (NREL) has found that a net zero grid by 2035 requires:[4]

- 8 GW[5] of new geothermal capacity.
- 5-8 GW of Hydropower depending on the scenario.
- Between 120–350 gigawatts of energy storage to support intermittent renewable energy.
- A tripling of U.S. nuclear capacity in the "constrained" (but likely) scenario where building numerous new transmission lines and solar and wind facilities is infeasible.[6]

Barriers

- **CCUS** can reduce fossil power plants emissions, but deployment has been hampered by **high costs, few commercial projects, and uncertainty regarding the permanence requirements.**
- **High construction costs, lengthy permitting requirements, and lack of acceptable nuclear waste solutions** have largely stopped commercial deployment of new nuclear plants.
- **Geologic constraints (or suitable river sites)** currently restrict geothermal and hydroelectric growth.
- **Limited long term energy storage alternatives.**

Accelerators

- **The Inflation Reduction Act contains $369 billion** in climate incentives, much of it focused on expanding clean energy production. Full, rapid deployment of **the IRA will accelerate clean generation technologies including CCUS, Energy Storage, SMR's, and advanced geothermal.**
- **Currently, two SMRs** are moving towards operation by 2030 in the U.S., but more are needed to meet 2035 grid decarbonization goals. The U.S. can **accelerate siting and construction of new nuclear units by repurposing coal plant sites** for new nuclear installations.[7]
- **A national carbon reduction mandate for fossil generation** and/or additional **voluntary corporate greenhouse gas reduction commitments** would accelerate GHG reductions in the power sector.
- Measures to support the commercialization of **enhanced geothermal system (EGS)** man-made reservoir technology could expand geothermal power by 100 GW, 30 times current capacity.[8]
- Support for development and commercialization of **long duration batteries** and other high-capacity energy storage solutions (e.g., pumped storage, compressed air, etc.).

Relevant NEMA Technologies

- Wire and Cables
- Motors and Generators
- Electrical Measuring Equipment
- Grid products including transformers, voltage regulators, monitors and meters
- Energy Storage

1 https://www.eia.gov/energyexplained/energy-and-the-environment/where-greenhouse-gases-come-from.php.
2 The Long-Term Strategy of the United States, Pathways to Net-Zero Greenhouse Gas Emissions by 2050 (whitehouse.gov)
3 In 2021. See https://www.eia.gov/tools/faqs/faq.php?id=427&t=3
4 NREL, Examining Supply-Side Options to Achieve100% Clean Electricity by 2035 (2022) https://www.nrel.gov/docs/fy22osti/81644.pdf; see also https://www.nrel.gov/analysis/100-percent-clean-electricity-by-2035-study.html.
5 A gigawatt (GW) provides power for ~750,000 homes. See: https://www.cnet.com/home/energy-and-utilities/gigawatt-the-solar-energy-term-you-should-know-about/#:~:text=For%20those%20who%20are%20looking,to%20power%20about%20750%2C000%20homes
6 https://www.nrel.gov/analysis/100-percent-clean-electricity-by-2035-study.html
7 See https://www.energy.gov/ne/articles/doe-report-finds-hundreds-retiring-coal-plant-sites-could-convert-nuclear
8 Geothermal Energy - ScienceDirect