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Nuclear Steam Generator Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented, By Reactor Type (Pressurized Water Reactors (PWRs), Boiling Water Reactors (BWRs), CANDU Reactors, Advanced Gas-cooled Reactors (AGRs), Sodium Fast Reactors (SFRs)), By Material (Alloy 800H, Alloy 690TT, Stainless Steel 316L, Titanium Alloys, Nickel Alloys), By Design Type (Once-Through Steam Generators (OTSGs), U-Tube Steam Generators (UTSGs), Helical-Coil Steam Generators (HCSGs), Compact Steam Generators (CSGs)), By Region, By Competition, 2020-2030F

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Abstracts

Market Overview

The Nuclear Steam Generator Market was valued at USD 4.94 Billion in 2024 and is expected to reach USD 7.11 Billion by 2030 with a CAGR of 6.09%. The Nuclear Steam Generator Market refers to the specialized segment of the nuclear power industry dedicated to the design, manufacturing, deployment, maintenance, and replacement of steam generators, which are critical components within pressurized water reactors (PWRs) and certain other nuclear reactor types, responsible for transferring heat produced during nuclear fission to the secondary side for steam production, thereby driving turbines to generate electricity.

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Nuclear steam generators serve as a crucial interface between the primary reactor coolant system and the secondary power generation cycle, ensuring efficient thermal energy transfer while providing an essential barrier that isolates radioactive material from the external power generation process, thereby contributing to both operational safety and efficiency. This market encompasses a broad value chain, including original equipment manufacturers (OEMs), engineering and construction companies, nuclear operators, maintenance and service providers, and suppliers of specialized materials designed to withstand extreme pressure, temperature, and radiation conditions.

The demand for nuclear steam generators is driven by several factors such as the expansion of nuclear power capacity worldwide, the modernization and replacement of aging reactor infrastructure, increasing emphasis on carbon-neutral energy solutions, and technological advancements aimed at improving generator performance, reliability, and lifespan. The market is also shaped by stringent regulatory requirements, as steam generators are vital safety-class components, requiring high standards of design validation, inspection, and quality assurance.

Key Market Drivers

Rising Global Energy Demand and Need for Clean, Reliable Power

The Nuclear Steam Generator market is witnessing strong momentum as rising global energy demand, coupled with the urgent need for clean and reliable power, accelerates nuclear power adoption as a long-term solution to energy security challenges. With populations expanding, urbanization intensifying, and industrialization advancing at an unprecedented pace, electricity demand continues to surge worldwide, pushing governments and utilities to explore sustainable power generation methods beyond conventional fossil fuels. Nuclear energy is increasingly being recognized as a stable and low-carbon source that can provide baseload electricity generation without the volatility of weather-dependent renewables.

This has positioned nuclear steam generators as critical components within the nuclear power infrastructure, responsible for efficiently transferring heat from the reactor core to produce steam that drives turbines and generates electricity. As nations work toward ambitious climate goals and carbon neutrality commitments, the deployment of nuclear power plants is accelerating, boosting demand for next-generation steam generators designed to operate with greater efficiency, durability, and safety. Additionally, the geopolitical push for energy independence is prompting both developed and emerging

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economies to diversify their energy mix with nuclear power, reducing dependence on imported fossil fuels and mitigating price fluctuations.

Nuclear steam generators are central to this strategy, as they ensure reliable plant operations while meeting stringent environmental and safety standards. Furthermore, the modernization of existing nuclear facilities through refurbishment and lifetime extension programs is driving the replacement and upgrading of steam generators, ensuring long-term operational efficiency. The combination of increasing power demand, clean energy transitions, and the role of nuclear energy in delivering stable electricity supply is creating a sustained growth trajectory for the global nuclear steam generator market. Global electricity demand is projected to surpass 30,000 TWh by 2030, reflecting the increasing reliance on electrification across industries and households. The world's installed renewable energy capacity has already crossed 3,000 GW globally, with strong growth in solar, wind, and hydropower. Over 70% of new power generation capacity additions worldwide are coming from clean energy sources, highlighting the shift toward sustainability. Global investment in clean energy technologies exceeded USD 1 trillion annually, underlining the demand for reliable and greener power infrastructure. By 2040, nearly 50% of the world's electricity is expected to come from renewable and low-carbon sources, strengthening the need for advanced power systems.

Key Market Challenges

High Capital Costs and Complex Regulatory Environment

The nuclear steam generator market faces a significant challenge in the form of extremely high capital costs coupled with the intricate regulatory environment governing nuclear projects worldwide. Nuclear steam generators are critical components within pressurized water reactors, requiring highly specialized design, advanced metallurgy, and rigorous quality assurance processes to ensure reliability and safety. This makes their development, manufacturing, and installation exceedingly costly compared to conventional power generation equipment. Beyond direct production costs, companies must navigate an exhaustive network of national and international nuclear safety standards, licensing procedures, and inspection protocols, which vary widely across jurisdictions.

Each project often involves years of planning, certification, and compliance audits, stretching lead times and inflating overall project budgets. The financial burden is further compounded by the costs of long-term operation, monitoring, and eventual

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decommissioning, all of which must be considered upfront. These high entry barriers discourage smaller players and limit competition, resulting in market dominance by only a handful of established firms with the resources and expertise to meet stringent requirements. Furthermore, financing such projects is a daunting task, as investors often hesitate to commit capital to nuclear infrastructure due to perceptions of risk, uncertainty about long-term returns, and growing focus on renewable alternatives. This challenge is magnified by political debates around nuclear energy, where shifts in government policy or public sentiment can delay approvals or halt projects altogether.

The cumulative effect is a bottleneck in new installations and replacements of nuclear steam generators, with many utilities deferring upgrades due to cost concerns. As global demand for cleaner energy intensifies, the inability of the nuclear sector to compete economically with lower-cost renewables and gas-fired power creates a fundamental obstacle to growth in the nuclear steam generator market. Companies in this sector must therefore strike a balance between delivering technologically advanced, safety-compliant equipment and finding innovative ways to reduce costs and shorten timelines to maintain competitiveness in an increasingly price-sensitive energy landscape.

Key Market Trends

Increasing Emphasis on Long-Term Plant Life Extension and Modernization

One of the most significant trends shaping the nuclear steam generator market is the increasing emphasis on long-term plant life extension and modernization, as governments, regulators, and utility operators seek to maximize the value of existing nuclear assets while ensuring their safe and efficient operation. Nuclear power plants are capital-intensive assets with lifespans originally designed for 30 to 40 years; however, with rising global demand for low-carbon baseload power, coupled with heightened energy security concerns, many countries are actively pursuing strategies to extend the operational life of their nuclear fleets.

This shift is creating a strong demand for advanced steam generator technologies that can withstand longer operating cycles, higher thermal efficiency requirements, and stricter safety standards. Steam generators are critical components in pressurized water reactors, and their integrity directly affects plant reliability, safety, and performance, making their replacement or modernization central to life extension programs.

Market players are responding with new designs that incorporate improved materials

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resistant to corrosion, fatigue, and stress cracking, while also delivering enhanced heat transfer performance to improve overall plant efficiency. Additionally, modernization efforts are increasingly supported by advanced non-destructive testing methods, predictive maintenance tools, and digital monitoring solutions, enabling operators to optimize asset performance and preemptively address issues before they lead to costly outages. This trend is particularly relevant in regions with aging nuclear fleets, such as North America, Europe, and parts of Asia, where extending plant operations by an additional 20 to 30 years is seen as both economically and environmentally advantageous.

The growing recognition of nuclear energy as a sustainable and stable power source in global energy transition strategies further underscores the importance of long-term plant operations, reinforcing demand for modernized nuclear steam generator solutions. Over the next decade, this focus on plant life extension and modernization will remain a dominant market driver, shaping technological advancements, investment priorities, and procurement strategies in the nuclear steam generator sector.

Key Market Players

Mitsubishi Heavy Industries Ltd

Westinghouse Electric Company LLC

BWX Technologies Inc.

Framatome

Hitachi-GE Nuclear Energy Ltd

Babcock & Wilcox Enterprises Inc.

China National Nuclear Corporation (CNNC)

Rosatom Corp.

Bharat Heavy Electricals Limited (BHEL)

Doosan Corp.

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Report Scope:

In this report, the Global Nuclear Steam Generator Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Nuclear Steam Generator Market, By Reactor Type:

Pressurized Water Reactors (PWRs)

Boiling Water Reactors (BWRs)

CANDU Reactors

Advanced Gas-cooled Reactors (AGRs)

Sodium Fast Reactors (SFRs)

Nuclear Steam Generator Market, By Material:

Alloy 800H

Alloy 690TT

Stainless Steel 316L

Titanium Alloys

Nickel Alloys

Nuclear Steam Generator Market, By Design Type:

Once-Through Steam Generators (OTSGs)

U-Tube Steam Generators (UTSGs)

Helical-Coil Steam Generators (HCSGs)

Compact Steam Generators (CSGs)

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Nuclear Steam Generator Market, By Region:

- North America
  - United States
  - Canada
  - Mexico
- Europe
  - France
  - United Kingdom
  - Italy
  - Germany
  - Spain
- Asia-Pacific
  - China
  - India
  - Japan
  - Australia
  - South Korea
- South America
  - Brazil

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Argentina

Colombia

Middle East & Africa

South Africa

Saudi Arabia

UAE

Kuwait

Turkey

Competitive Landscape

Company Profiles: Detailed analysis of the major companies presents in the Global Nuclear Steam Generator Market.

Available Customizations:

Global Nuclear Steam Generator Market report with the given Market data, Tech Sci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

Detailed analysis and profiling of additional Market players (up to five).

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