On-Grid Combined Heat and Power Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented, By Technology (Internal Combustion Engine, Gas Turbine, Microturbine, Fuel Cell, Stirling Engine), By Application (Residential, Commercial, Industrial), By Fuel Type (Natural Gas, Biomass, Coal, Renewable Energy, Waste Heat), By System Configuration (Single-Heat, Dual-Heat, Multi-Heat), By Region, By Competition, 2020-2030F

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Report description:

Market Overview

Global On-Grid Combined Heat and Power Market was valued at USD 25.61 Billion in 2024 and is expected to reach USD 33.09 Billion by 2030 with a CAGR of 4.21%. The On-Grid Combined Heat and Power (CHP) Market refers to the segment of the energy industry focused on systems that simultaneously generate electricity and useful thermal energy from a single fuel source, with the electricity being supplied directly to the power grid. These systems are designed to achieve higher overall energy efficiency compared to conventional methods of separate heat and power generation. On-grid CHP systems are typically integrated into municipal, industrial, institutional, and commercial facilities where there is a consistent demand for both electricity and heat, such as in manufacturing plants, hospitals, universities, and large residential complexes.

Unlike off-grid CHP systems that operate independently, on-grid CHP solutions are connected to the main power distribution network, allowing excess electricity to be exported to the grid and ensuring a reliable backup supply during peak demand or maintenance. The core advantage of these systems lies in their ability to reduce fuel consumption and lower greenhouse gas emissions by utilizing waste heat that would otherwise be lost in traditional power generation. On-grid CHP installations often use natural gas, biogas, coal, biomass, or waste-derived fuels to drive turbines or engines, which generate power while capturing and

repurposing heat for space heating, water heating, or industrial processes.

Key Market Drivers

Increasing Demand for Energy Efficiency and Decentralized Power Generation

The growing global focus on energy efficiency and decentralized energy systems is a primary driver for the on-grid combined heat and power (CHP) market. Governments, utilities, and industries are increasingly seeking integrated energy solutions that offer improved efficiency, reduced energy losses, and lower operational costs. On-grid CHP systems, which simultaneously generate electricity and useful thermal energy from a single fuel source, typically achieve total efficiencies exceeding 80%, compared to conventional systems that waste a significant portion of input energy as heat. This high efficiency is particularly valuable in urban areas and industrial zones where both electricity and heat are in high demand. As global electricity consumption rises, especially in emerging economies, grid-tied CHP systems offer a reliable and flexible alternative to large-scale centralized generation. These systems can also relieve grid congestion and reduce transmission and distribution losses by generating power close to the point of use. Moreover, rising awareness among commercial and industrial end-users about the benefits of CHP, such as energy cost savings and enhanced resilience during grid outages, is further propelling adoption. Governments across developed and developing nations are supporting energy efficiency programs, offering incentives and policy frameworks to promote the installation of on-grid CHP systems. This aligns with broader global sustainability goals and climate action plans focused on reducing carbon emissions, improving energy access, and increasing the share of low-emission technologies in the energy mix. As more businesses and municipalities seek integrated energy strategies that reduce reliance on conventional power grids while maintaining connectivity for flexibility and backup, on-grid CHP systems are emerging as a preferred solution.

Their ability to serve as distributed energy resources (DERs) capable of grid support, load balancing, and even participating in demand response programs further enhances their appeal. The continued push for decarbonization, energy resilience, and efficiency is expected to accelerate the deployment of on-grid CHP systems across residential, commercial, and industrial sectors, establishing them as a cornerstone in the global transition toward smarter and more sustainable energy infrastructure. Global energy efficiency improvements could reduce energy demand by up to 30% by 2040. Decentralized power generation is expected to contribute over 40% of global electricity supply by 2030. Investments in energy-efficient technologies are projected to exceed USD 500 billion annually worldwide. More than 70 countries have national policies promoting energy efficiency and distributed energy systems. Global demand for decentralized energy solutions is growing at a CAGR of over 6%. Around 60% of new power capacity additions globally are expected to come from decentralized sources by 2030.

Key Market Challenges

High Capital Investment and Long Payback Period

One of the primary challenges facing the on-grid combined heat and power (CHP) market is the substantial upfront capital investment required for system installation, integration, and maintenance. The implementation of CHP systems involves the deployment of sophisticated equipment such as gas turbines, reciprocating engines, heat recovery units, and grid integration mechanisms, all of which contribute to a significant initial financial burden for project developers, industries, and utilities. This challenge is particularly prominent in small and medium-sized enterprises (SMEs) and commercial facilities, where budgetary constraints often hinder the adoption of such technologies, even when long-term cost savings and energy efficiency gains are apparent.

Additionally, the payback period for on-grid CHP systems can extend over several years, which may deter investment, especially in regions or sectors that prioritize short-term returns. The return on investment (ROI) is highly dependent on fluctuating energy prices, fuel costs, local grid tariffs, and government incentives-factors that introduce financial unpredictability and discourage potential adopters. Moreover, the installation process is complex and requires skilled labor, careful planning, and system customization to ensure compatibility with existing infrastructure, which adds to the overall cost.

Even though the operational cost of CHP systems is generally lower compared to conventional systems, the initial capital outlay and slow ROI can result in reluctance among stakeholders to commit to long-term energy infrastructure upgrades. Furthermore, in markets where subsidies for conventional power generation are still in place, the relative financial advantage of on-grid CHP becomes less attractive. These economic barriers are compounded by limited access to financing options or lack of favorable lending terms in certain regions, particularly in developing economies. Financial institutions may view CHP projects as high-risk ventures due to technological complexity, regulatory uncertainty, and long amortization periods. In many cases, a lack of

awareness or technical knowledge about the full economic and environmental benefits of CHP systems further hampers market penetration.
This financial challenge is not only slowing adoption but also limiting innovation and scale-up, particularly for smaller market participants. Without consistent policy support in the form of tax incentives, feed-in tariffs, or capital subsidies, the adoption rate of on-grid CHP solutions remains constrained. To overcome this challenge, there is a growing need for innovative financing models such as energy-as-a-service, leasing arrangements, or public-private partnerships that can reduce the financial burden on end users. However, until such mechanisms are widely adopted and integrated into national energy frameworks, high capital costs and long payback periods will continue to be a major restraint in the expansion of the on-grid combined heat and power market across various sectors and geographies.
Key Market Trends
Increasing Integration of Renewable Energy with CHP Systems
A major trend reshaping the on-grid combined heat and power (CHP) market is the increasing integration of renewable energy sources with CHP systems to enhance energy efficiency and sustainability. Traditional CHP systems, which primarily operate on natural gas or other fossil fuels, are now being hybridized with solar thermal, biomass, and biogas technologies to create hybrid energy systems that are both cleaner and more cost-effective. This trend is gaining momentum as countries worldwide commit to net-zero emission targets and decarbonization strategies. The integration of renewables into on-grid CHP setups not only reduces dependency on fossil fuels but also improves grid stability by providing consistent base-load power and thermal energy.
These hybrid systems are increasingly being adopted in urban and industrial zones to meet rising energy demands while minimizing environmental impact. In addition, government incentives, subsidies, and policy frameworks supporting renewable energy adoption are accelerating this trend, making it economically attractive for industries and utilities to invest in integrated CHP solutions. Technological advancements in energy management systems, automation, and smart grids are further enabling seamless synchronization between renewable inputs and CHP units, optimizing performance and reducing energy losses. Moreover, the development of advanced thermal storage technologies allows CHP systems to store excess heat generated from renewable sources, improving flexibility and dispatchability of power.
The ability of CHP systems to operate alongside solar PV installations or use biogas from waste treatment facilities also presents a circular economy opportunity, enhancing energy security and resource utilization. This trend is expected to continue gaining traction, particularly in developed nations and regions with high renewable energy penetration, as energy producers and consumers alike seek more resilient, cost-effective, and low-carbon energy solutions that align with sustainability goals.
Key Market Players
□□Siemens Energy AG
□□General Electric (GE)
□□Caterpillar Inc.
□□Mitsubishi Power, Ltd.
□□MAN Energy Solutions SE
□□Clarke Energy
□□2G Energy AG
□□Bosch Thermotechnology
□□Capstone Green Energy Corporation
□□ABB Ltd.
Report Scope:
In this report, the Global On-Grid Combined Heat and Power Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:
□□On-Grid Combined Heat and Power Market, By Technology:
- o Internal Combustion Engine
- o Gas Turbine
- o Microturbine
- o Fuel Cell

- Stirling Engine

On-Grid Combined Heat and Power Market, By Application:

- Residential
- Commercial
- Industrial

On-Grid Combined Heat and Power Market, By Fuel Type:

- Natural Gas
- Biomass
- Coal
- Renewable Energy
- Waste Heat

On-Grid Combined Heat and Power Market, By System Configuration:

- Single-Heat
- Dual-Heat
- Multi-Heat

On-Grid Combined Heat and Power 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
  - 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 On-Grid Combined Heat and Power Market.

Available Customizations:

Global On-Grid Combined Heat and Power 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).

Table of Contents:

On-Grid Combined Heat and Power Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, Segmented, By Technology (Internal Combustion Engine, Gas Turbine, Microturbine, Fuel Cell, Stirling Engine), By Application (Residential, Commercial, Industrial), By Fuel Type (Natural Gas, Biomass, Coal, Renewable Energy, Waste Heat), By System Configuration (Single-Heat, Dual-Heat, Multi-Heat), By Region, By Competition, 2020-2030F

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