



THERMAL ENERGY STORAGE MARKET

GLOBAL FORECAST TO 2022



THERMAL ENERGY STORAGE MARKET - GLOBAL FORECAST TO 2022

By Technology (Sensible, Latent, TCS), Storage Material (Water, Molten Salt, PCM), Application (Power Generation, District Heating & Cooling, Process Heat & Cold), End-User, and Region



REPORT OVERVIEW

1.1 OBJECTIVES OF THE STUDY

- To define, describe, and forecast the global thermal energy storage market on the basis of technology, storage material, application, end-user, and region
- To provide detailed information regarding major factors influencing the market growth (drivers, restraints, opportunities, and industry-specific challenges)
- To strategically analyze the thermal energy storage market with respect to individual growth trends of manufacturers & service providers, their future expansions, and contribution to the market
- To forecast the growth of the thermal energy storage market with respect to main regions (Asia-Pacific, Europe, the Americas, and the Middle East & Africa)
- To strategically profile key market players and comprehensively analyze their market shares and core competencies
- To track and analyze market opportunities for stakeholders and details of competitive developments, such as contracts & agreements, mergers & acquisitions, expansions, and new product/technology launches in the thermal energy storage market

1.2 MARKET DEFINITION

Thermal Energy Storage: Thermal Energy Storage (TES) is a technology that stores thermal energy by either heating or cooling a storage medium. The thermal energy is stored to be used at a later time for heating and cooling applications and power generation. TES systems are used particularly in buildings and industrial processes.

Thermal energy storage system consists of three components, namely, the storage medium, heat transfer mechanism, and containment system. The storage medium stores the thermal energy either in the form of sensible heat, latent heat of the phase change material (PCM), & in the form of reversible chemical reactions (thermochemical storage, TCS) or adsorption or the adhesion of a substance to the surface of another solid or liquid.

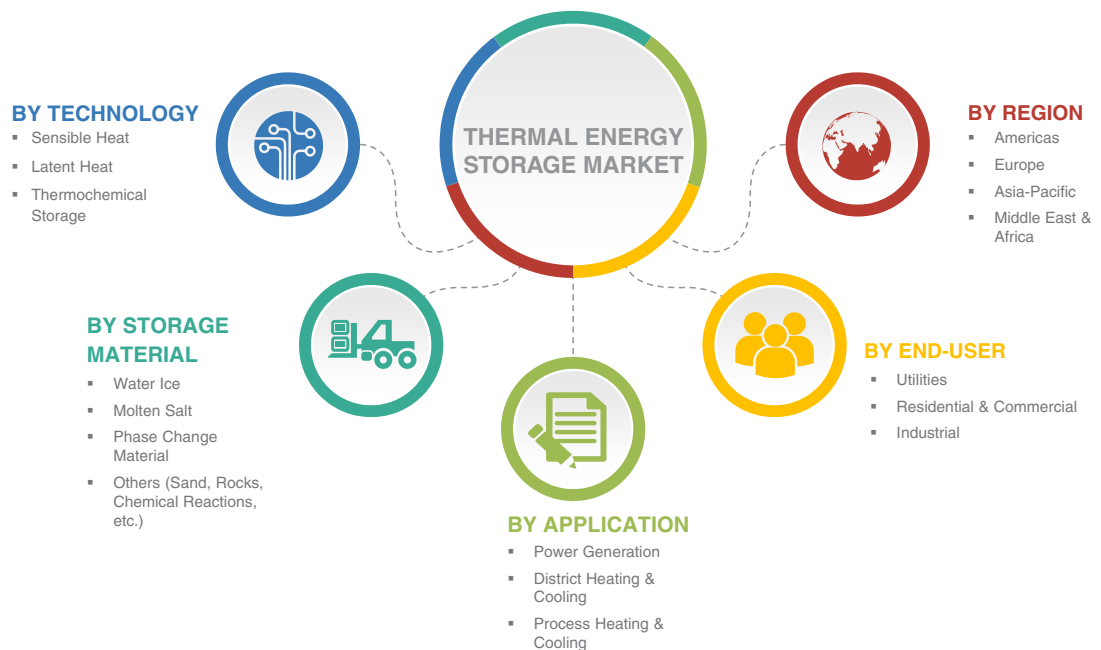
Sensible heat storage refers to storing thermal energy by heating or cooling the storage medium (such as water, molten salts, sand, and rocks) without phase change. Latent heat storage system uses PCMs (such as from a solid state into a liquid state), where the storage material undergoes phase change. Thermochemical storage refers to the use of reversible chemical reactions, and release thermal energy.

The stored thermal energy based on sensible heat is commercially available, while storage based on PCMs and TCS have higher thermal capacity than sensible heat. PCM and TCS based storage systems are not commercially viable, as they are under-developed and are in demonstration phase.

1.3 MARKET SCOPE

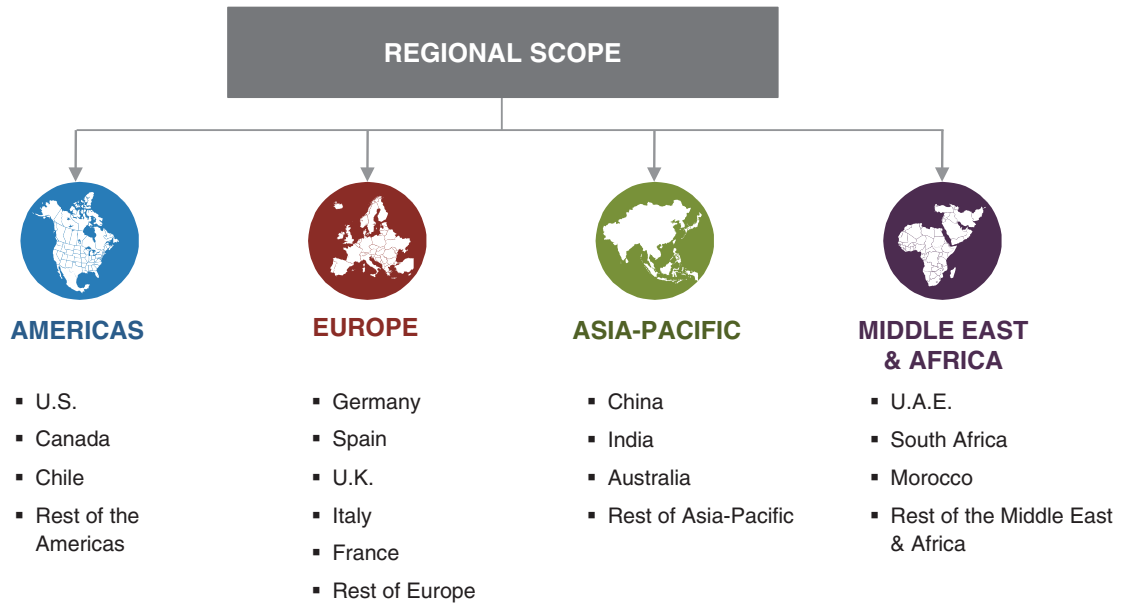
1.3.1 MARKETS COVERED

This report segments the thermal energy storage market as follows:



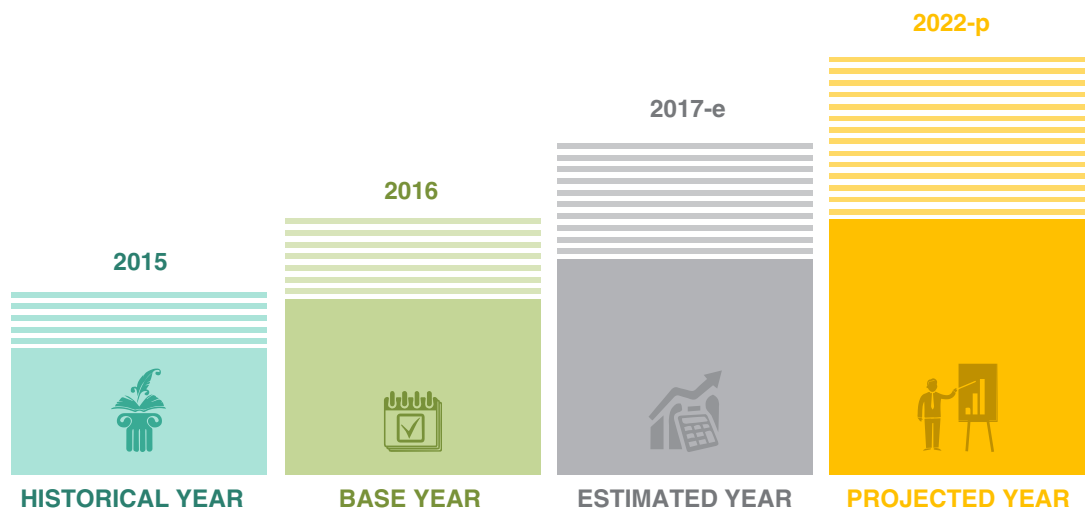
Source: Related Research Publications and MarketsandMarkets Analysis

1.3.2 REGIONAL SCOPE



*Note: Rest of Americas include Argentina, Brazil, and Mexico among others
 Rest of Europe include Ireland, Sweden, Austria, and Greece among others
 Rest of Asia-Pacific include Japan and Thailand among others
 Rest of Middle East & Africa include Egypt, Iran and Israel among others
 Source: Related Research Publications and MarketsandMarkets Analysis*

1.3.3 YEARS CONSIDERED FOR THE STUDY



*e – Estimated; p – Projected
 Note: The base year used for the company profiles was 2016. Wherever recent data was unavailable, the prior year (2015) has been considered*

1.4 CURRENCY

The currency used in the report is the U.S. Dollar (USD), with market size indicated only in USD million/USD billion.

- For companies reporting revenues in USD, the revenues have been picked from the annual report.
- For companies reporting revenues in currencies other than USD, the average annual currency conversion rate has been used for the particular year to convert the value to USD.
- For conversion of various currencies to USD, average historical exchange rates have been used according to the year specified.
- For all historical and current exchange rates required for calculations and currency conversions, the US Forex website has been used.

1.5 LIMITATIONS

The scope of study is limited to two primary applications for thermal energy storage, which are type of application (district heating / industrial, non-domestic, and domestic), and duration and discharge cycles (intra-day and inter-seasonal storage). Potential ability of TES technologies to use for multi-day or weekly cycles have not been considered for thermal energy storage market.

1.6 STAKEHOLDERS

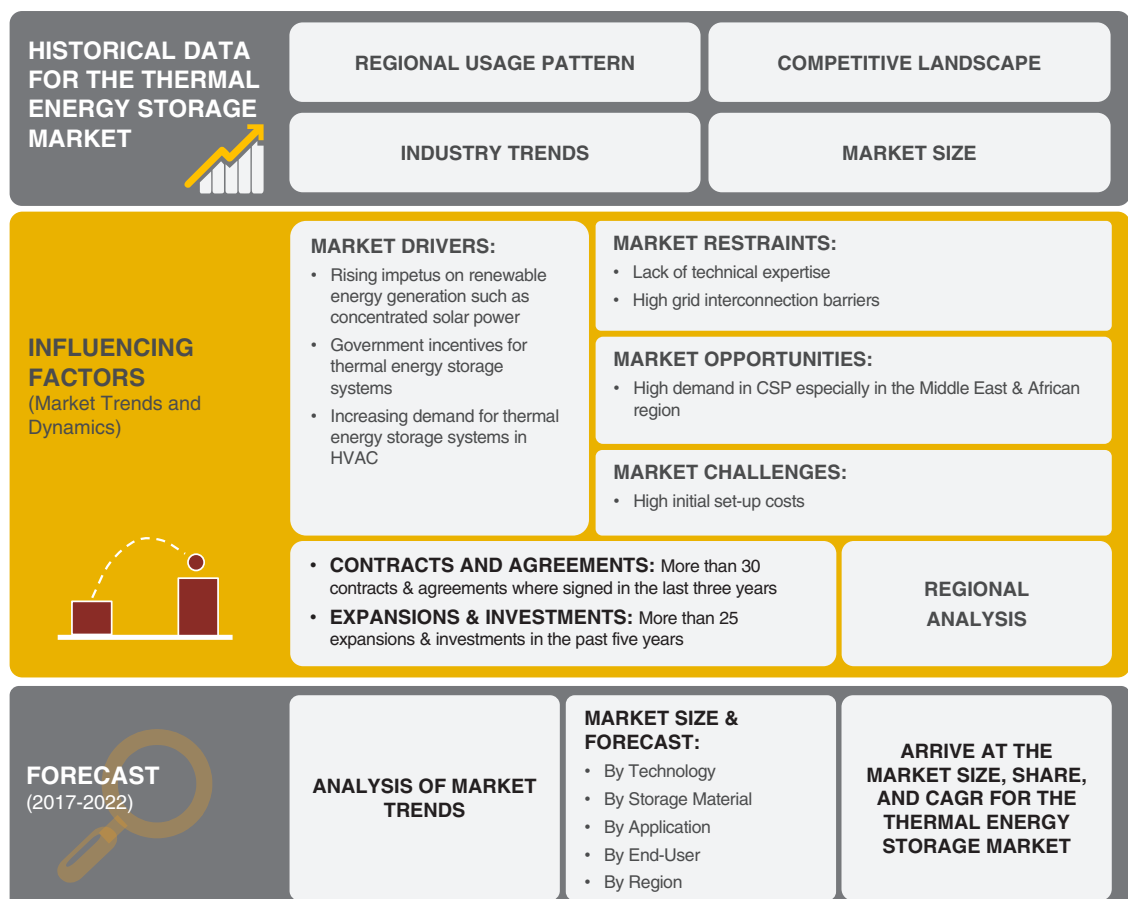
- Battery storage manufacturers
- Chillers and tank manufacturers for thermal energy storage
- Consulting companies in the energy sector
- Conventional and renewable heating systems providers
- Environmental associations
- Government organizations and research institutions
- Investment banks
- Regional renewable energy associations
- Thermal energy storage system providers

2.1 INTRODUCTION

This research study involved the use of extensive primary and secondary sources to identify and collect information for this extensive, technical, market-oriented, and commercial study of the market. Secondary sources include directories; databases; journals; company newsletters; and information portals such as Hoover's, Bloomberg, and Factiva. Primary sources are several industry experts from core and related industries, vendors, suppliers, technology developers, alliances, and organizations.

In-depth interviews have been conducted with various primary respondents including key industry participants, subject-matter experts, C-level executives of key market players, and industry consultants, among other experts to obtain and verify critical qualitative and quantitative information as well as assess future prospects. The following figure shows the market research design applied to this report on the thermal energy storage market.

FIGURE 1 THERMAL ENERGY STORAGE MARKET: RESEARCH DESIGN



Source: Company Websites, Government Publications, and MarketsandMarkets Analysis

2.1.1 SECONDARY DATA

Secondary sources referred to for this research study include thermal energy storage system manufacturers, region-wise commissioned thermal energy storage projects, Solar Energy Industries Association, National Energy Administration corporate filings (such as annual reports, investor presentations, and financial statements), and publications from trade, business, and professional associations, among others. Secondary data has been collected and analyzed to arrive at the overall market size, which has been further validated through primary research.

2.1.1.1 KEY DATA FROM SECONDARY SOURCES

PARAMETER	SOURCE
MARKET SIZE (Value)	<ul style="list-style-type: none"> • Company Financials • Magazines • Journals • Press Releases • Paid Databases • MarketsandMarkets Data Repository
REVENUE OF COMPANIES	<ul style="list-style-type: none"> • Annual Reports • Company Websites • Public Databases • MarketsandMarkets Data Repository
QUALITATIVE INFORMATION (Market Dynamics, Market Trends)	<ul style="list-style-type: none"> • Company Websites • Annual Reports • Press Releases • MarketsandMarkets Data Repository

2.1.2 PRIMARY DATA

Extensive primary research has been conducted after acquiring knowledge about the thermal energy storage market through secondary research. Several primary interviews have been conducted with market experts from both the demand (residential and commercial, etc.) and supply sides (thermal energy storage providers) across regions, namely, North America, Europe, Asia-Pacific, and the Middle East & Africa. Approximately 65% and 35% primary interviews have been conducted with the demand and supply sides, respectively. This primary data has been collected through questionnaires, e-mails, and telephonic interviews.

2.1.2.1 KEY DATA FROM PRIMARY SOURCES

TYPE	PARAMETER	KEY DATA
REGIONAL SPLIT	<ul style="list-style-type: none"> Overall market and subsegments in 2016 CAGR of each region during the forecast period (2017–2022) 	<ul style="list-style-type: none"> The global thermal energy storage market, by region—Asia-Pacific, Europe, the Americas, and the Middle East & Africa
MARKET SIZE	<ul style="list-style-type: none"> The global market size for 2015 CAGR for the forecast period (2017–2022) 	<ul style="list-style-type: none"> The global thermal energy storage market The thermal energy storage market, by subsegments
MARKET SPLIT	<ul style="list-style-type: none"> Technology: Sensible Heat, Latent Heat, Thermochemical Storage Storage Material: Water Ice, Molten Salt, Phase Change Material, Others Application: Power Generation, District Heating & Cooling, Process Heating & Cooling End-User: Utilities, Residential & Commercial, Industrial Region: The Americas, Europe, Asia-Pacific, and the Middle East & Africa 	Thermal Energy Storage Market, <ul style="list-style-type: none"> By Technology By Storage Material By Application By End-user By Region

2.1.2.2 KEY INDUSTRY INSIGHTS



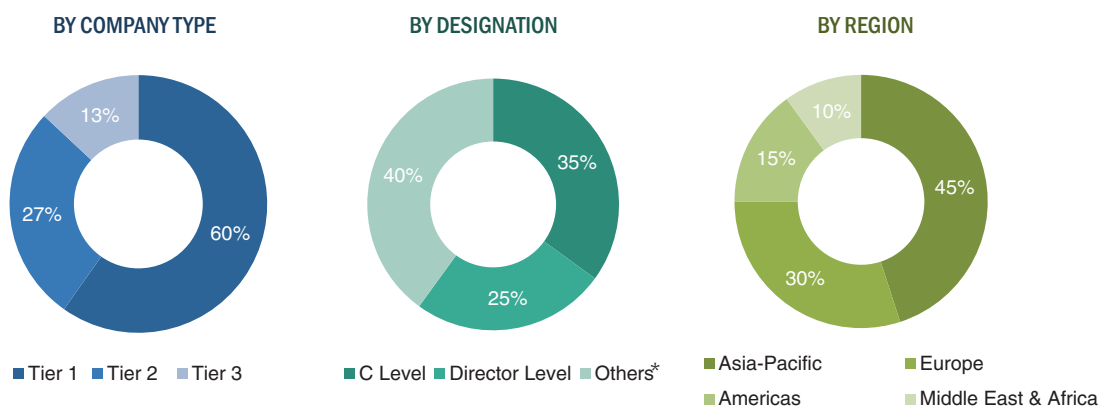
Source: Industry Experts and MarketsandMarkets Analysis

2.1.2.3 BREAKDOWN OF PRIMARIES

The key players in the market have been identified through secondary research and their market shares in respective regions have been determined through primary research. This entire process includes the study of annual and financial reports of the top market players and in-depth interviews, for key insights, with industry leaders such as CEOs, VPs, directors, and marketing executives. All percentage shares, splits, and breakdowns have been determined by using secondary sources and verified through primary sources. All possible parameters that affect the markets covered in this research study have been accounted for, viewed in extensive detail, verified through primary research, and analyzed to arrive at the final quantitative and qualitative data.

With the data triangulation process and validation of data through primaries, the exact values of the overall parent market size and each individual market size have been determined and confirmed in this study.

FIGURE 2 BREAKDOWN OF PRIMARY INTERVIEWS: BY COMPANY TYPE, DESIGNATION, & REGION



Note: RoW = The Rest of the World

The tier of the companies has been defined based on their total revenue, as of 2015: Tier 1 = USD 501 million to USD 1000 million, Tier 2 =

From USD 251 million to USD 500 million and Tier 3 = <USD 250 million

Source: Industry Experts and MarketsandMarkets Analysis

2.2 MARKET SIZE ESTIMATION

Both top-down and bottom-up approaches have been used to estimate and validate the size of the thermal energy storage market. The following figure shows an illustrative representation of the overall market size estimation process employed for the purpose of this study.

FIGURE 3 MARKET SIZE ESTIMATION METHODOLOGY: BOTTOM-UP APPROACH

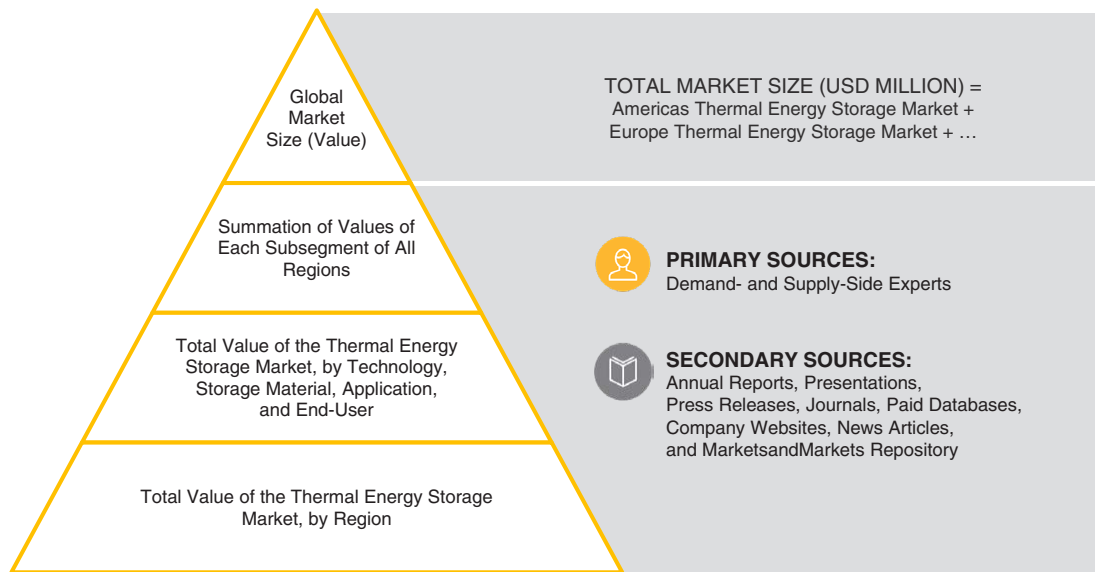
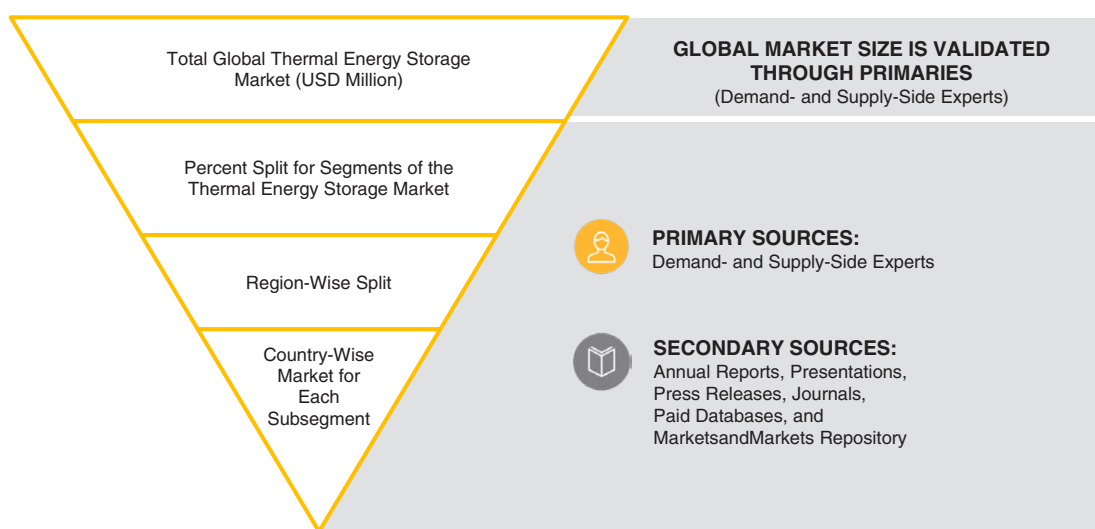


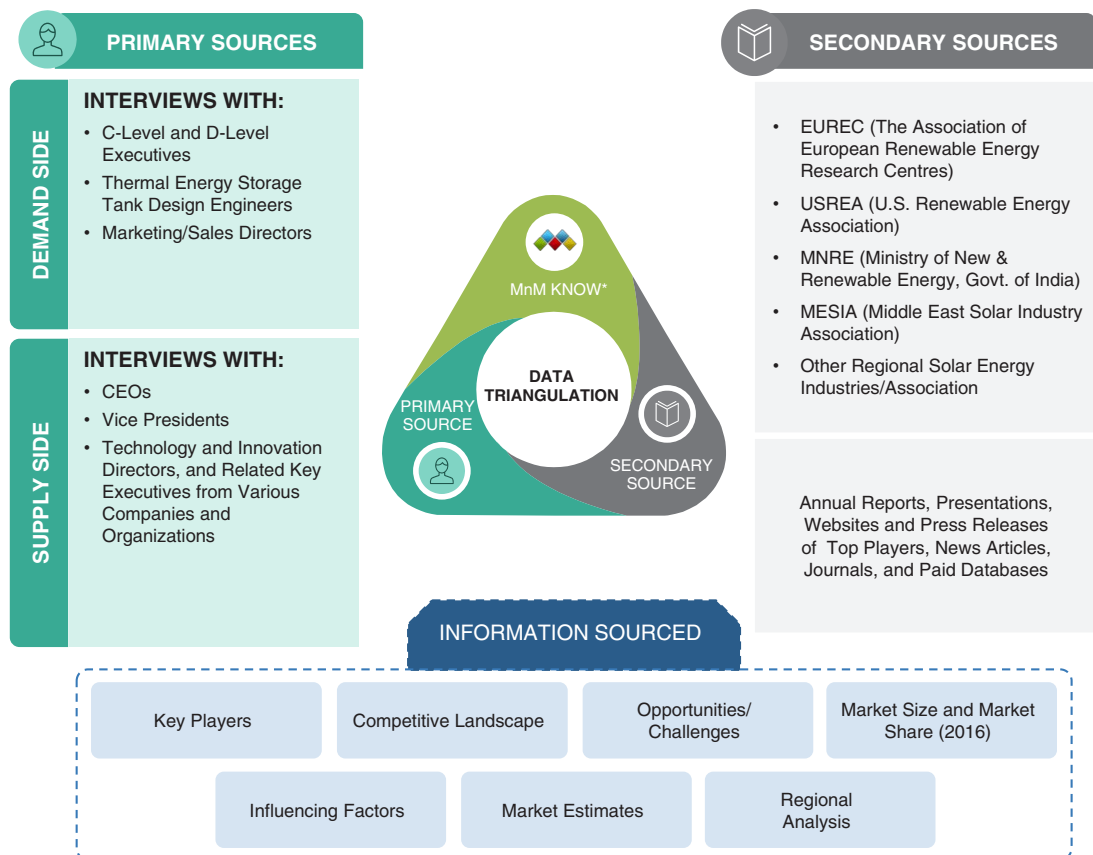
FIGURE 4 MARKET SIZE ESTIMATION METHODOLOGY: TOP-DOWN APPROACH



2.3 MARKET BREAKDOWN & DATA TRIANGULATION

The market has been split into several segments and subsegments by various types of classifications after arriving at the overall market size from the market size estimation process explained above. In order to complete the overall market engineering process and arrive at exact statistics for all the market segments and subsegments, the data triangulation and market breakdown processes, explained below, have been implemented, wherever applicable.

FIGURE 5 DATA TRIANGULATION METHODOLOGY



MnM KNOW* stands for MarketsandMarkets' "Knowledge Asset Management" framework. In this context, it stands for an existing market research knowledge repository of over 5,000 granular markets, our flagship competitive intelligence and market research platform "RT," subject-matter experts, and independent consultants. MnM KNOW acts as an independent source that helps us validate information gathered from primary and secondary sources .

2.4 RESEARCH ASSUMPTIONS & LIMITATIONS

For the calculation of each specific market segment, the most immediate parent market size has been used to implement the top-down approach.

2.4.1 ASSUMPTIONS

PARAMETERS	ASSUMPTION
COST TRENDS	Average cost of the solution depends on the design, capacity, technology, and cost variation of the storage medium. This has been assumed to decrease over time as per the preferred technology for storing thermal energy. Inflation is not a part of pricing and has been kept constant throughout the year for calculating market size.
FUTURE INVESTMENT TRENDS	Future investment trends have been assumed on the projected investments in a particular region in thermal energy storage and adoption of grid-tied renewable energy
PRICE TRENDS	The fluctuations in the price of the balance of system, solar field, and containment of thermal energy storage have not been considered.

Note: The market values have been rounded off till one decimal point. Due to this, there may be a slight difference in the actual total and the total mentioned in the table.

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TABLE 1 THERMAL ENERGY STORAGE MARKET SIZE, BY TYPE, 2015–2022 (USD MILLION)

TECHNOLOGY	2015	2016	2017-e	2022-p	CAGR (2017–2022)
Sensible	XX.X	XX.X	XX.X	XX.X	XX.X%
Latent	XX.X	XX.X	XX.X	XX.X	XX.X%
TCS	XX.X	XX.X	XX.X	XX.X	XX.X%
TOTAL	XX.X	XX.X	XX.X	XX.X	XX.X%

e – Estimated; p – Projected
 Source: Secondary Sources, Expert Interviews, and MarketsandMarkets Analysis

TABLE 2 GLOBAL THERMAL ENERGY STORAGE MARKET SIZE, BY STORAGE MATERIAL, 2015–2022 (USD MILLION)

STORAGE MATERIAL	2015	2016	2017-e	2022-p	CAGR (2017–2022)
Molten Salt	XX.X	XX.X	XX.X	XX.X	XX.X%
PCM	XX.X	XX.X	XX.X	XX.X	XX.X%
Water	XX.X	XX.X	XX.X	XX.X	XX.X%
Others	XX.X	XX.X	XX.X	XX.X	XX.X%
TOTAL	XX.X	XX.X	XX.X	XX.X	XX.X%

e – Estimated; p – Projected
 Others include sand, rock, concrete, and chemical reactions among others
 Source: Secondary Source, Expert Interviews, and MarketsandMarkets Analysis

TABLE 3 WATER: THERMAL ENERGY STORAGE MARKET SIZE, BY REGION, 2015–2022 (USD MILLION)

REGION	2015	2016	2017-e	2022-p	CAGR (2017–2022)
Asia-Pacific	XX.X	XX.X	XX.X	XX.X	XX.X%
Americas	XX.X	XX.X	XX.X	XX.X	XX.X%
Middle East & Africa	XX.X	XX.X	XX.X	XX.X	XX.X%
Europe	XX.X	XX.X	XX.X	XX.X	XX.X%
TOTAL	XX.X	XX.X	XX.X	XX.X	XX.X%

e – Estimated; p – Projected
 Source: Secondary Source, Expert Interviews, and MarketsandMarkets Analysis

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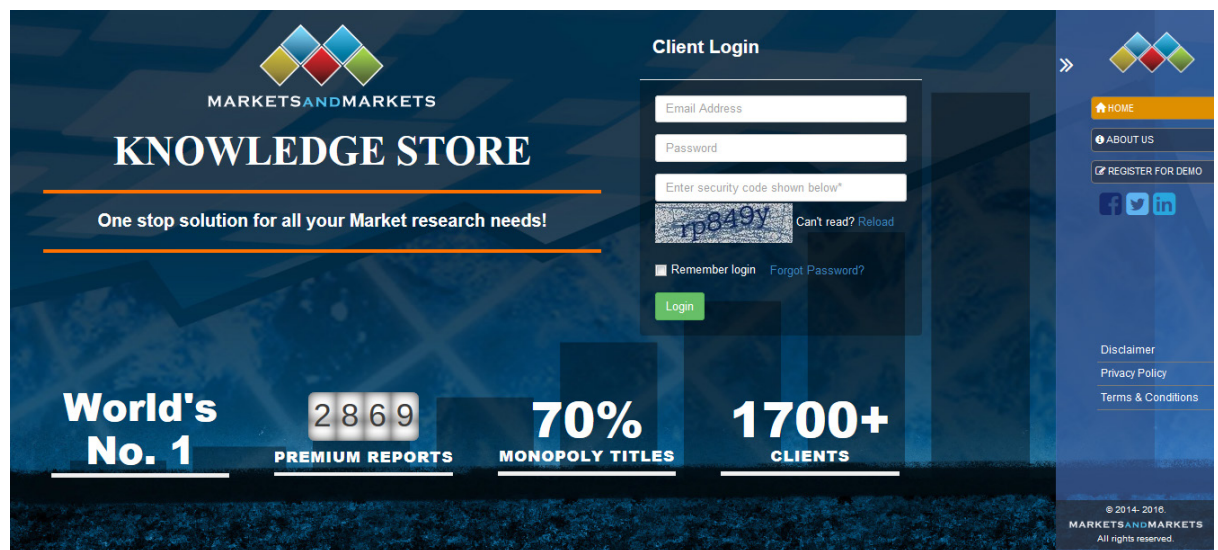
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