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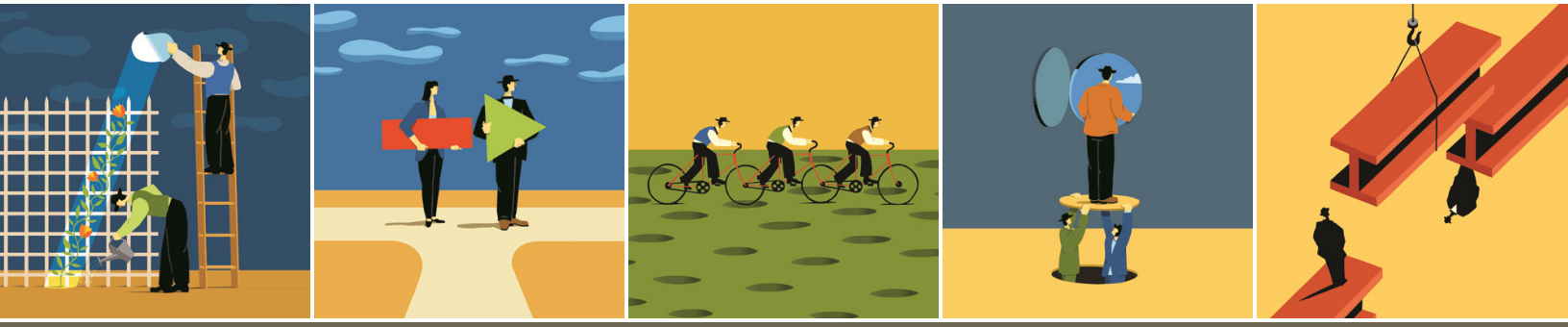

RESEARCH REPORT

Executive Summary:

Microgrids

Commercial/Industrial, Community/Utility, Campus/Institutional, Military, Remote, Grid-Tied Utility Distribution, and Direct Current Microgrids: Global Market Analysis and Forecasts

NOTE: This document is a free excerpt of a larger report. If you are interested in purchasing the full report, please contact Navigant Research at research-sales@navigant.com.

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Section 1
EXECUTIVE SUMMARY

1.1 Global Survey of Today's Microgrid Market

It is now 4 years since Navigant Research took its first comprehensive look at the microgrid market. Until recently, the vast majority of microgrids coming online, whether grid-connected or off-grid, have been pilot projects or research and development (R&D) experiments. Today the industry is moving into the next phase of project development, focusing on how to develop projects on fully commercial terms. It appears that the main technology components have made significant headway. The key to future growth now rests with greater creativity in both the public policy and business model arenas.

This report identifies nine different business models for microgrids. It also takes a deep dive into the market in North America, which currently has captured over half of all vendor revenue activity. The increasing frequency of severe weather is prompting utilities in the United States and around the world to reconsider their historic opposition to customer-owned microgrids that can disconnect from the larger grid and island, allowing critical mission functions to stay up and running. Yet, utilities continue to worry about how a proliferation of customer-owned microgrids might complicate their job and perhaps erode their traditional revenue base. Should regulators instead allow utilities to build, own, or control these microgrids in some sort of coordinated, enterprisewide fashion?

Although a comprehensive suite of policies necessary to stimulate wider microgrid deployments has yet to be articulated by any single government, this report presents a series of maps of incentives that help build the business case for microgrids in the United States, the world's leading microgrid market. These incentives range from the expansion of net metering for distributed renewables to natural gas utility revenue decoupling.

1.2 Report Scope

The microgrid market has clearly undergone an evolution. While this report continues to break out and forecast the market according to the same five segments that have been widely adopted throughout the industry, Navigant Research has sliced up the market into new subsegments. The analysis in this report focuses on two specific subsegments – grid-tied utility distribution microgrids (UDMs) and direct current (DC) microgrids – that are attracting increased market attention.

The primary microgrid segments that have been traditionally forecast in terms of capacity and revenue by Navigant Research are as follows:

» **Commercial/industrial (C/I) microgrids:** This segment is quickly maturing, especially in North America.

» **Community/utility microgrids:** Europe leads this segment, with Denmark's high penetration of distributed wind requiring aggregation networks that represent over 80% of all microgrid activity there.

» **Campus/institutional microgrids:** The typical focus of these microgrids is to aggregate existing onsite generation with multiple loads that are co-located in a campus setting.

» **Military microgrids:** The focus of these microgrids is security, both cyber and physical.

» **Remote microgrids:** These microgrids never connect to a larger grid and, therefore, operate in island mode on a 24/7 basis.

The two new subsegments that are forecast in this report are:

» **Grid-tied UDMs:** A subset of the community/utility segment, these microgrids face the largest regulatory barriers, but could lead to the largest-scale deployments over the long term.

» **DC microgrids:** This subsegment overlaps with some of the others profiled in this report, as it encompasses both grid-tied and remote systems and is a technology rather than an application approach to microgrid segmentation.

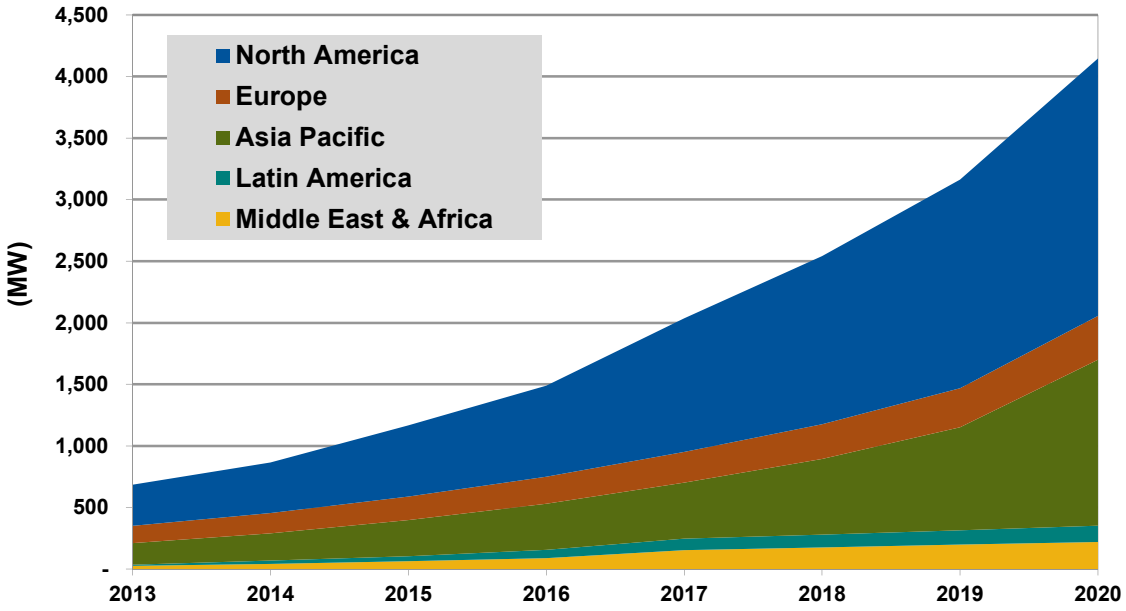
In addition, this report offers a more granular regional perspective on microgrid development, dividing the previous Rest of World (ROW) geographical segment into Latin America and the Middle East & Africa. Moving beyond a traditional regional approach to market characterization, this report also breaks new ground in identifying the world's top 10 markets outside of the United States. Navigant Research developed a base scenario for each of these 10 countries, along with corresponding vendor revenue. Since the United States is such a dominant player in the global market, this report also segments the top five U.S. state markets, ranked as per current online, under development, and planned capacity according to data from Navigant Research's global database. These U.S. state forecasts focus on a base scenario for both capacity and vendor revenue.

This report identifies nine different business models being deployed to build microgrids today. It also provides profiles of 18 companies, with three tables highlighting other leading utilities, grid infrastructure providers, and selected purveyors of "nuts and bolts" hardware solutions that can tie together the necessary software needed to optimize distributed energy resources. Furthermore, case studies of a state government microgrid deployment initiative and both a remote island and a grid-tied utility distribution microgrid are presented to illustrate new forms of policy support and real world applications of microgrid-enabling technologies.

1.3 Market Forecasts

According to the base scenario, annual capacity is expected to increase from 685 MW in 2013 to more than 4 GW by 2020, a compound annual growth rate (CAGR) of 29.3%. As can be seen in Chart 1.1, North America will maintain its leadership role over the 7-year forecast period. The Asia Pacific region will gradually increase market share over time, with a CAGR of 33.9% for microgrid capacity. Navigant Research believes that while North America dominates the microgrid market today and through 2020, the Asia Pacific region will likely emerge as the global leader for microgrid deployments by 2030 or 2035 due to the huge need for power for growing populations not served by traditional grid infrastructure. Europe is, relatively speaking, a laggard on microgrids because its preferred aggregation and optimization platform is the virtual power plant (described later in this report). The region's grid reliability is far superior to that in North America, limiting the appeal of islanding capability.

Chart 1.1 Annual Total Microgrid Capacity by Region, Base Scenario, World Markets: 2013-2020



(Source: Navigant Research)

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Section 10

SCOPE OF STUDY

Navigant Research has prepared this report to provide participants at all levels of the microgrid market, including utilities, project developers, hardware and software vendors, and public and private sector funders, with forecasts for the capacity and revenue associated with five major microgrid segments and two new subsegments (grid-tied utility distribution microgrids, or UDMs, and DC microgrids). The study's major objective is to assess the market size and anticipated growth of overall vendor revenue for both grid-tied and remote off-grid microgrids throughout the world. Five major global regions – North America, Europe, Asia Pacific, Latin America, and the Middle East & Africa – are included. The forecast extends through 2020 and is broken out according to three different scenarios: conservative, base, and aggressive.

The report's purpose is not to provide an exhaustive technical assessment of all of the technologies and industries that may be deployed in microgrids – RDEG, storage, inverters, and other components. Instead, it aims to provide a strategic examination of the market for microgrids within the context of the smart grid movement. Navigant Research strives to identify and examine new market segments to aid readers in the development of their business models.

SOURCES AND METHODOLOGY

Navigant Research's industry analysts utilize a variety of research sources in preparing Research Reports. The key component of Navigant Research's analysis is primary research gained from phone and in-person interviews with industry leaders including executives, engineers, and marketing professionals. Analysts are diligent in ensuring that they speak with representatives from every part of the value chain, including but not limited to technology companies, utilities and other service providers, industry associations, government agencies, and the investment community.

Additional analysis includes secondary research conducted by Navigant Research's analysts and its staff of research assistants. Where applicable, all secondary research sources are appropriately cited within this report.

These primary and secondary research sources, combined with the analyst's industry expertise, are synthesized into the qualitative and quantitative analysis presented in Navigant Research's reports. Great care is taken in making sure that all analysis is well-supported by facts, but where the facts are unknown and assumptions must be made, analysts document their assumptions and are prepared to explain their methodology, both within the body of a report and in direct conversations with clients.

Navigant Research is a market research group whose goal is to present an objective, unbiased view of market opportunities within its coverage areas. Navigant Research is not beholden to any special interests and is thus able to offer clear, actionable advice to help clients succeed in the industry, unfettered by technology hype, political agendas, or emotional factors that are inherent in cleantech markets.

NOTES

CAGR refers to compound average annual growth rate, using the formula:

CAGR = (End Year Value ÷ Start Year Value)$^{(1/steps)}$ – 1.

CAGRs presented in the tables are for the entire timeframe in the title. Where data for fewer years are given, the CAGR is for the range presented. Where relevant, CAGRs for shorter timeframes may be given as well.

Figures are based on the best estimates available at the time of calculation. Annual revenues, shipments, and sales are based on end-of-year figures unless otherwise noted. All values are expressed in year 2013 U.S. dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.

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