



Research Report

EXECUTIVE SUMMARY:

Smart Appliances

Household Appliances on the Smart Grid:
Energy Management and Demand Response
Applications, Communications Technologies,
Standards, and Key Industry Players

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Jon Walton
Industry Analyst

Bob Gohn
Senior Analyst

Section 1

EXECUTIVE SUMMARY

1.1 Smart Appliance Overview

Global efforts to reduce greenhouse gases are changing the energy industry. Aggressive mandates established by the Kyoto Protocol and other international agreements are driving governments and industry to develop policies, infrastructure, and tools to improve the ways we manage energy. Smart grid initiatives around the world are rolling out smart meters with the vision of improved load management, increased reliability, and consumer awareness. Smart appliances have a significant role to play in realizing this vision because they provide the all-important link to the biggest residential energy loads.

The smart appliance market is on the cusp of transitioning from the development stage to commercialization and growth. Fueled in large part by stimulus funds, appliance manufacturers have been working with utilities and other technology vendors to test and pilot various capabilities enabled by smart appliances. From a technology perspective, market players have demonstrated that it is relatively easy to produce a home appliance that can utilize two-way communications to interact with energy management systems. Yet, unfortunately for the smart appliance industry, the secret to unlocking the market is not completely in their hands.

There are four key drivers behind realizing widespread smart appliance adoption:

- **Dynamic pricing** – A necessary element to elicit changes in the way consumers use energy. Utilities and regulators will determine how prevalent these tariffs will be.
- **Standards** – Communications standards must be defined to handle messaging between appliances, the grid, and any other parties involved in managing energy. Industry groups, manufacturers, and governments are working to gain consensus quickly.
- **Control & privacy** – Consumers demand final control over their devices and want their data to be managed in confidence. Vendors will have to prove that they can manage data successfully.
- **Education** – There is a lack of understanding among the stakeholder groups as to what smart appliances and the smart grid can do. Innovations and best practices need to be shared so that all participants are willing to play.

Indications are that the industry is close to resolving two of these issues: standards and control & privacy. Through continued testing efforts, Pike Research expects a few select standards to emerge that will be adopted by the industry. On the standards front, ZigBee is likely to dominate RF smart appliance implementations while HomePlug Green PHY is the likely winners in power line carrier (PLC) initiatives. Once these standards are adopted on a wider scale, Pike Research believes that manufacturers will begin to embed communications technologies in the majority of their product lines. At this point in time, embedded communication modules will be part of the standard feature set on most major appliances.

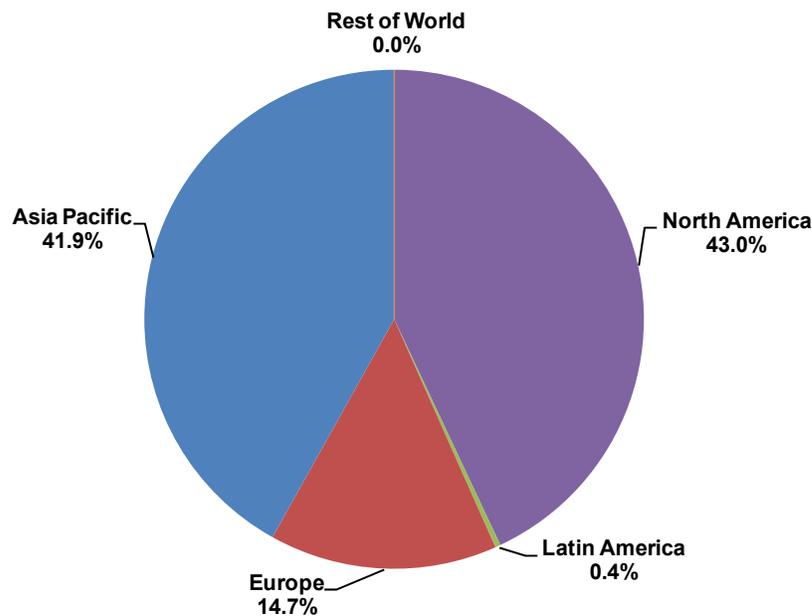
Due to backing by networking and data management experts, including Cisco, IBM, and Oracle, the smart grid should be able to manage consumer privacy and security concerns. The question of control will continue to be worked out by utilities, many of which want full control of smart appliances, as well as by manufacturers and HAN vendors.

Note, though, that education is an ongoing effort by all parties. Pike Research is most concerned about consumer education efforts, as negative publicity related to smart grid projects in Italy and the United States has slowed these projects and impacted others.

1.2 Worldwide Smart Appliance Market Landscape and Forecast

North America, Asia Pacific, and Europe will dominate the smart appliance market throughout the 2010-2019 forecast period. Pike Research expects worldwide smart appliance sales to reach \$26 billion by 2019. Strong growth in the smart grid and energy management sectors will fuel smart appliance purchases over the next 10 years. Chart 2.2 illustrates the prominence of Asia Pacific and North America in 2019, as those regions will account for over 80% of smart appliance demand. Leading manufacturers are designing, testing, and manufacturing intelligent appliances capable of managing energy usage at the component level based on consumer-set parameters. As various smart grid elements are built out, Pike Research expects to see strong demand for smart appliances due to an increasing number of tariffs and incentives.

Chart 1.1 Smart Appliance Segmentation by Region, World Markets: 2019



(Source: Pike Research)

Smart metering efforts in the three leading regions of Asia Pacific, Europe and North America will be the primary driver for smart appliance sales. The vast majority of smart appliance projects are directly associated with smart meter rollouts and are seen as a way to provide customer benefits from what are largely infrastructure-dominated projects.

In North America, Canada is well on its way toward achieving 100% smart meter penetration while the United States is just starting to see projects from its massive \$4.5 billion smart grid stimulus funding initiated. Most smart appliance pilots in these two countries have been rather small in size, typically under 200 homes, and designed to provide feedback for a larger testing effort.

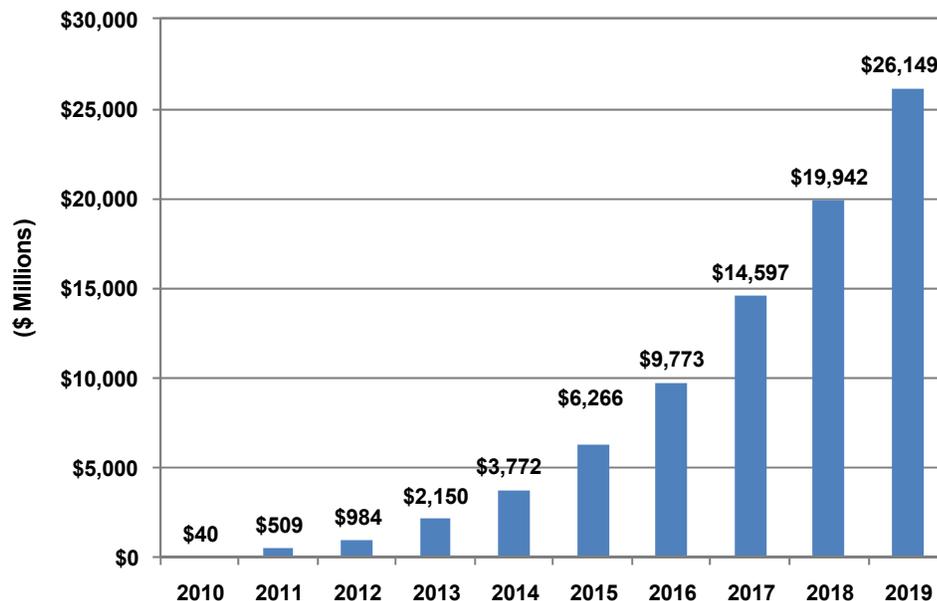
China will be the leading smart appliance market in the Asia Pacific region. With a rapidly growing economy and population, China is investing heavily in smart grid initiatives. Combined with increasing levels of disposable income and low household appliance penetration rates, this will lead to a \$10 billion smart appliance sector by 2019. Australia has a number of projects underway testing a variety of related technologies.

In Europe, multiple countries have extensive piloting efforts underway. Smart appliance projects in Italy, Germany, the United Kingdom, and Spain are evaluating refrigerators, freezers, clothes washers, and clothes dryers. The only downside to the EU market is low penetration rates for home energy management tools, which may bleed into the smart appliance market.

Manufacturers of smart appliances have strong global representation. Key industry players, including Bosch, Electrolux, GE, Indesit, and Whirlpool, have pilot programs underway. On the other hand, some manufacturers have taken a wait-and-see approach to the smart grid. They are not aggressively pursuing deals and are content to sit on the sidelines watching the field. Manufacturers are concerned with the size and scope of projects relative to the number of meters being installed. With millions of meters deployed, manufacturers would like to see more efforts toward understanding consumer responses to smart appliances and the overall grid.

These are exciting times for those in the smart appliance industry. Pike Research's projections call for the market to reach \$6.3 billion by 2015 and close to \$26.1 billion by 2019. New tariffs and technologies will open up even more possibilities for smart appliances in the future. Right now, consumers, manufacturers, utilities, and the environment stand to gain something with the introduction of smart appliances.

Chart 1.2 Smart Appliance Market Value by Region, World Markets: 2010-2019



(Source: Pike Research)

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SCOPE OF STUDY

Smart appliances are a relatively new addition to the suite of consumer facing energy management tools. Fueled by the smart grid initiatives around the world, the market for smart appliances is just beginning to be realized. Appliances that can communicate and respond to signals and messages have the potential to reshape the ways in which energy is managed. Manufacturers, utilities and consumers all have a vested interest in bringing these advanced devices to the market.

To better understand the potential of the smart appliance market, Pike Research has prepared this report, which includes:

- Identification of governmental efforts and regulatory mandates throughout the world impacting the smart appliance market
- Detailed review of enabling technologies including an analysis of communication standards and protocols
- Examination of consumer motivations for purchasing
- Global market forecasts including an analysis of the unique market impacts in each region/country
- Examination of appliance manufacturers and their smart appliance strategies

This Smart Appliances report includes a comprehensive examination of this emerging market. It provides key players and stakeholders with valuable information on market drivers, enabling technologies and the competitive landscape.

SOURCES AND METHODOLOGY

Pike Research's industry analysts utilize a variety of research sources in preparing Research Reports. The key component of Pike 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 Pike Research's analysts and the firm's 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 Pike 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.

Pike Research is an independent market research firm whose goal is to present an objective, unbiased view of market opportunities within its coverage areas. The firm 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:

$$\text{CAGR} = (\text{End Year Value} \div \text{Start Year Value})^{(1/\text{steps})} - 1.$$

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 2010 U.S. dollars unless otherwise noted. Percentages may not add up to 100 due to rounding.

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1320 Pearl Street, Suite 300
Boulder, CO 80302 USA
Tel: +1 303.997.7609
<http://www.pikeresearch.com>

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