

Smart Grid Insights: Smart Appliances

The Smart Grid ecosystem is a globe-spanning network of thousands of companies, including: system integrators, technology vendors, power and utility integrators, telecoms, service providers, sales vendors and at its core - manufacturers.

This smart appliance report by Zpryme:

- Begins with a global perspective and progresses into high-growth markets such as **China, US, UK, and Australia**
- Taps into the **consumer** and Smart Grid psyche
- Examines the role of Smart Grid **integrators, utilities, and manufactures**
- And concludes with **actionable insights** and **opportunities** to capitalize on the smart appliance market in both the short and long term

March 2010

Dear Executives,

Zpryme kindly welcomes you to our first installment of *Smart Grid Insights*. The year is off to a historic start, the transition from today's grid to the grid of tomorrow is seemingly right around the corner.

With growth like this it's easy for all members of the Smart Grid ecosystem to overlook the consumer. What's imperative in 2010 is to not only educate consumers about the benefits of the Smart Grid, but also to better understand and engage their energy consumption needs. This is where 'smart appliances' finally step in and allow consumers to 'opt-in' to the Smart Grid.

To date, consumers have not experienced a physical [smart] energy device that they can relate to. With government stimulus inspiring innovation and companies like GE and Whirlpool leading the way, the next 'sonic-boom' will be the advent and evolution of the modern [smart] appliance for 'griders' i.e. future Smart Grid consumers.

I know this latest report will provide both thought-provoking commentary and actionable insight for your organization. I personally welcome your thoughts on the forward-thinking information Zpryme has addressed in this report as well as suggestions for upcoming features. Please feel free to contact us about this month's issue via email at smart.grid@zpryme.com.

Kind Regards,



Jason S. Rodriguez
CEO & Director of Research
Zpryme Research & Consulting, LLC

“... the next
'sonic-boom' will
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Executive Summary



Executive Summary

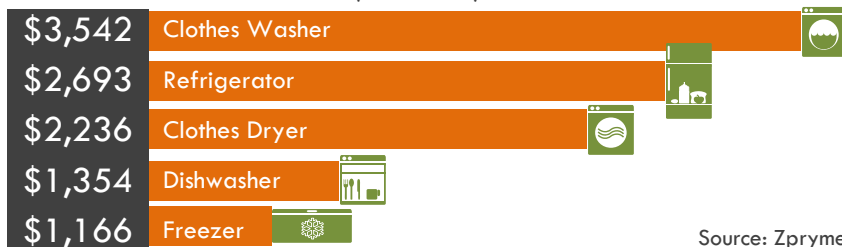
Fundamental shifts are taking place in the way people everywhere consume energy. Sure smart appliances may come with higher price tags in the beginning; however increased utility rates and government rebates will prompt consumers to replace their old appliances when they realize their potential return on investment in the long run – it's not that simple. A recent study by Ipsos gauging US and UK consumer awareness and attitudes towards Smart Grid technology found that most were previously unfamiliar with Smart Grid technology (74% in the US and 90% in the UK).¹ These findings are difficult to stomach given the billions of dollars that have been invested globally in everything from Smart Grid meters to Smart Grid EV charging stations.

So can this widening gap in understanding, engaging, and educating consumers be averted? To do so, there must be a strong collaborative effort in Smart Grid education by the public and private sector to drive home the 'message' to consumers. Consequently, this is where smart appliances can become the tangible difference in educating consumers about the Smart Grid.

Smart Appliance Market

From 2011 to 2015, the global household smart appliance market is projected to grow from \$3.06 billion to \$15.12 billion. In 2015, the global market size for smart washers and smart refrigerators will reach \$3.54 billion and \$2.69 billion, respectively.

Global Smart Appliance Market by Product, 2015
(US millions)



Source: Zpryme

¹ Ipsos poll conducted June 26th - June 30th, 2009 included a US national sample of 1,093 adults and a UK national sample of 1,034 adults aged 18 and older who were surveyed online.

How Well Do You Know Your Consumer?

Consumer education from every Smart Grid ecosystem member is critical to making the Smart Grid a global victory for all stakeholders.

Smart Appliance Drivers & Trends

What will drive this [smart appliances] relatively untapped space are the following trends: pricing, environment, energy efficiency, Smart Grid build-out, and government subsidies. Further, driven by GE and Whirlpool with added 'connectivity' support from such companies as Trilliant and Tendril Networks, consumers will initially aim to purchase larger appliances such as refrigerators, dishwashers, clothes washers and dryers, and stoves/ovens.^{2,3}

Insights & Opportunities

- Retailers (e.g. US: Best Buy; Australia: Myer; UK: Tesco; China: Wal-Mart) have new categories [small and large smart appliances] for growth to capitalize on
- There is a tremendous opening in US, China, UK, and Australia markets to develop smart appliances that are exclusively designed for the commercial and industrial sector
- China and UK consumer [smart appliance] adoption relies heavily on the return on investment for the long-term rather than the amount of the initial purchase price

Smart Grid Federal Stimulus

It's certainly worth noting that while China leads in total Smart Grid stimulus funding with \$7.3 billion, the US leads in Smart Grid stimulus per capita with \$23.09 followed by Spain \$19.90, South Korea \$17.00, and Australia \$16.92 respectively.

What's Next

As an industry and an emerging market space, smart appliances will become the next 'sonic-boom' for the clean technology industry.

² Trilliant provides intelligent network solutions and software to utilities for advanced metering, demand response, and Smart Grid management; source: www.trilliantinc.com.

³ The Tendril Residential Energy Ecosystem (TREE) enables consumers to better understand their energy consumption patterns; source: www.tendrilinc.com.

Background & Scope



Background & Scope: Smart Appliance Definition

For the purpose of this report, Zpryme has adopted the smart appliance definition referenced by the Association of Home Appliance Manufacturers' (AHAM) *Smart Grid White Paper* released in December of 2009. According to AHAM, "the term "Smart Appliance" with respect to the Smart Grid refers to a modernization of the electricity usage system of a home appliance so that it monitors, protects and automatically adjusts its operation to the needs of its owner." AHAM lists the following six key features that are associated with Smart Appliances:

1. Dynamic electricity pricing information is delivered to the user, providing the ability to adjust demand of electrical energy use.
2. It can respond to utility signals, contributing to efforts to improve the peak management capability of the Smart Grid and save energy by:
 - a. Providing reminders to the consumer to move usage to a time of the day when electricity prices are lower, or
 - b. Automatically "shed" or reduce usage based on the consumer's previously established guidelines or manual overrides.
3. Integrity of its operation is maintained while automatically adjusting its operation to respond to emergency power situations and help prevent brown or blackouts.
4. The consumer can override all previously programmed selections or instructions from the Smart Grid, while insuring the appliance's safety functions remain active.
5. When connected through a Home Area Network and/or controlled via a Home Energy Management system, Smart Appliances allow for a "total home energy usage" approach. This enables the consumer to develop their own Energy Usage Profile and use the data according to how it best benefits them.

6. It can leverage features to use renewable energy by shifting power usage to an optimal time for renewable energy generation, i.e., when the wind is blowing or sun is shining.

Market Definition:

For the purpose of this report, the household smart appliances market reflects the sale of clothes dryers, clothes washers, refrigerators, freezers, dishwashers, range tops, ovens, microwaves, coffee makers, and toaster ovens. The product segmentation of this report is broken out into the following six product categories:⁴



Clothes Dryers



Freezers



Clothes Washers



Dishwashers



Refrigerators

• Other Appliances

Manufacturer selling prices have been used to calculate the market value. All figures are stated in US dollars. Also, some percentages may not add up exactly to 100% due to rounding.

Geographic Coverage:

This report showcases the projected Global smart appliance market value from 2011 to 2015, and the projected smart appliance market for Australia, China, the United Kingdom, and the United States.

See Appendix For:

- **Figure 1:** Appliance Cost Per Year in US
- **Figure 2:** Smart Grid Stimulus % of GDP for 2010 (Selected from top ten countries by total Smart Grid stimulus)
- **Figure 3:** Top Ten Countries by Smart Grid Stimulus for 2010
- **Figure 4:** Smart Grid Stimulus Per Capita for 2010 (Selected from top ten countries by total Smart Grid stimulus)

⁴ 'Other Appliances' include: range tops, ovens, microwaves, coffee makers, and toaster ovens.

Smart Appliances: Marketplace

Global Smart Grid Stimulus Factsheet

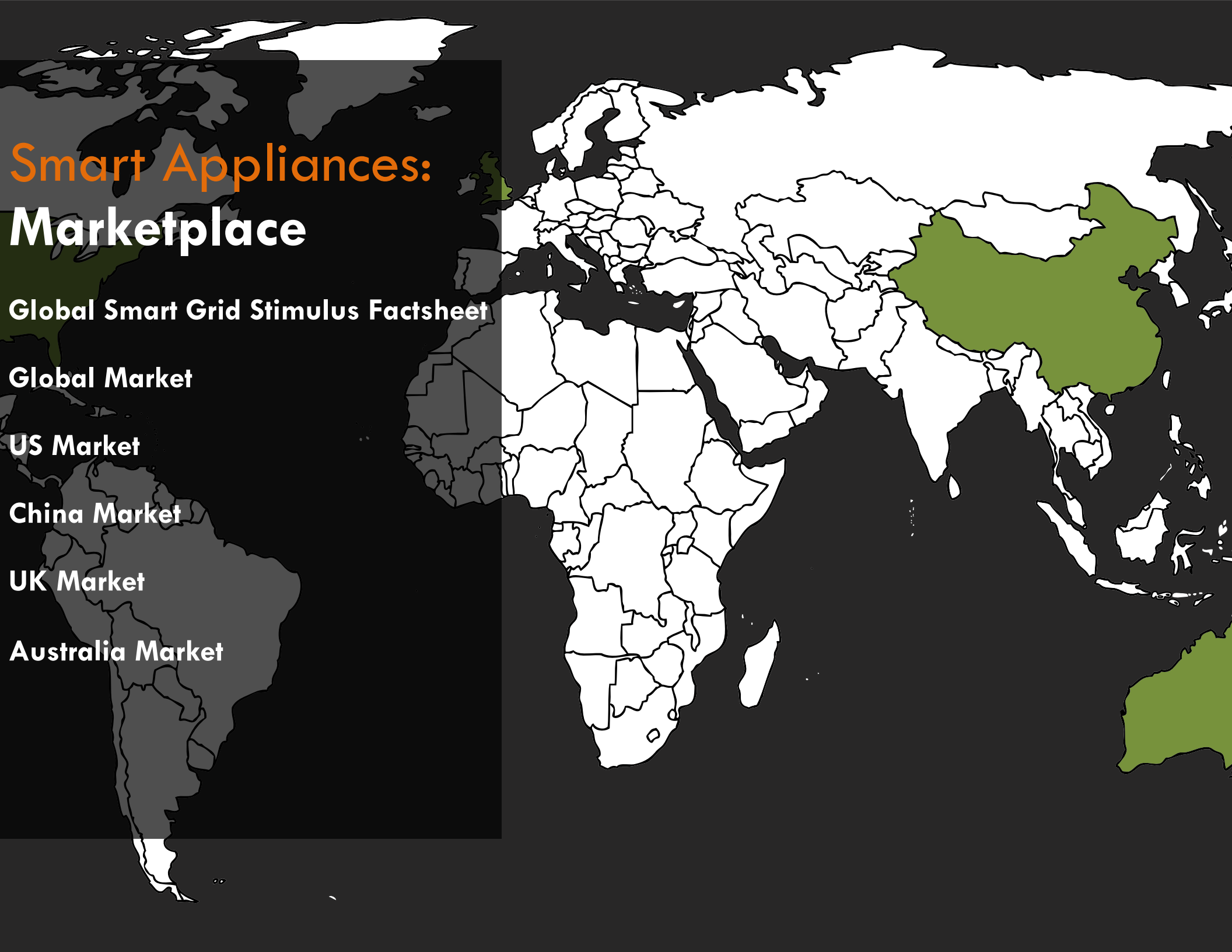
Global Market

US Market

China Market

UK Market

Australia Market



Global Smart Grid Stimulus Factsheet

(Top Ten Countries by Smart Grid Stimulus, 2010)

Country	Rank	Stimulus	Rank	Stimulus Per Capita	Rank	Stimulus % of GDP	Rank	GDP	Rank	Population	
China	1	\$7,323	6	\$5.47	1	.154%	3	\$4,758	1	1,339	
US	2	\$7,092	1	\$23.09	4	.050%	1	\$14,270	2	307	
Japan	3	\$849	5	\$6.68	6	.017%	2	\$5,049	4	127	
South Korea	4	\$824	3	\$17.00	2	.103%	10	\$800	8	49	
Spain	5	\$807	2	\$19.90	3	.056%	8	\$1,438	9	41	
Germany	6	\$397	7	\$4.82	9	.012%	4	\$3,235	5	82	
Australia	7	\$360	4	\$16.92	5	.039%	9	\$920	10	21	
UK	8	\$290	8	\$4.75	8	.013%	6	\$2,198	7	61	
France	9	\$265	9	\$4.14	10	.010%	5	\$2,635	6	64	
Brazil	10	\$204	10	\$1.03	7	.014%	7	\$1,482	3	199	
		*US millions			*USD			*US billions			*millions

Source: CIA World Factbook and respective government stimulus packages announced in 2009

GLOBAL

(SMART APPLIANCE MARKET)

*Left Column: 2015; Right Column: ROW (34% share); 2015 in US millions

Other Major Stats below

US 36%

Smart Appliance Market Share (2011)

China 18%

Smart Appliance Market Share (2011)

AUS & UK 10%

Smart Appliance Market Share (Combined, 2011)

\$3,542

Clothes Washer (23% share)



\$2,693

Refrigerator (18% share)



\$2,236

Clothes Dryer (15% share)



\$1,354

Dishwasher (9% share)



\$1,166

Freezer (8% share)



Smart Grid Cloud

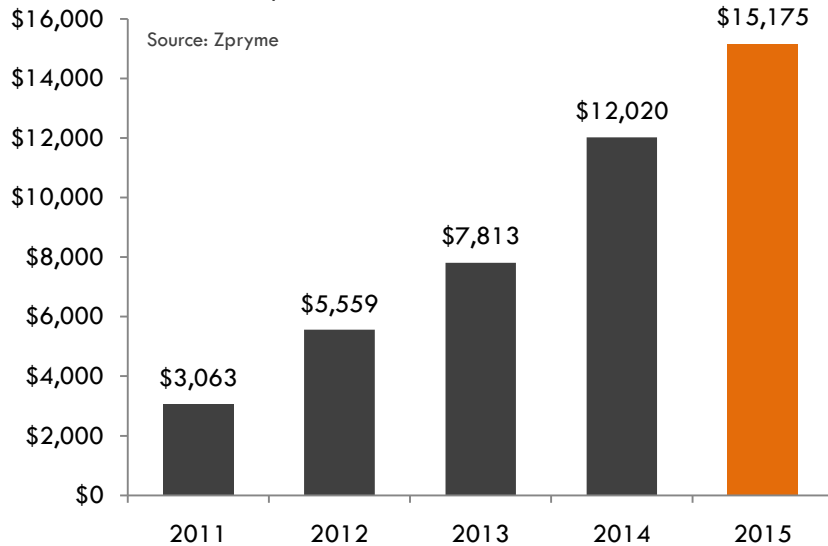
Along with **Fuji Electric Holdings Co.**, **GE** will enter Japan's growing market for next-generation power distribution systems by developing and producing network-capable power meters. **Alvarion** deployed 1,000 base stations in Spain, in partnership with leading Spanish WiMAX carrier Iberbanda - the deployments (BreezeMAX) are providing high speed data and voice services to a large population in Spain. **Duke Energy** plans to spend \$1 billion (USD) in a five-year deployment plan across five states in the US to install Smart Grid technology. **Samsung** affiliates are already involved in advancing technologies and services at the country's Smart Grid test bed on Jeju Island - **Samsung** is collaborating with Korea **KEPCO** and **KT** to develop "smart place" solutions for residential buildings. **Fluke Corporation** will receive \$1.4 million (USD) to create a new calibration technology, the first step towards creating a standard to enable consistent measurement of electricity flowing into the Smart Grid. **IBM** and **Johnson Control**, announced a new relationship to create a new era of smarter buildings.

Global Market

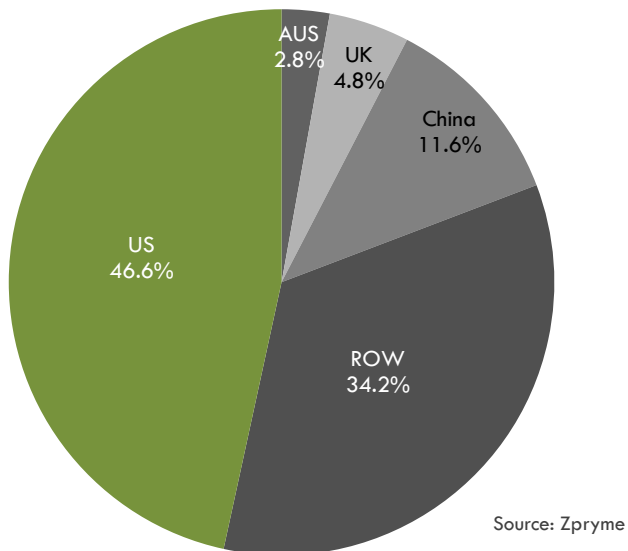
Projected Global Smart Appliance Market Value

2011 - 2015 | (US millions)

Compound Annual Growth Rate = 49%



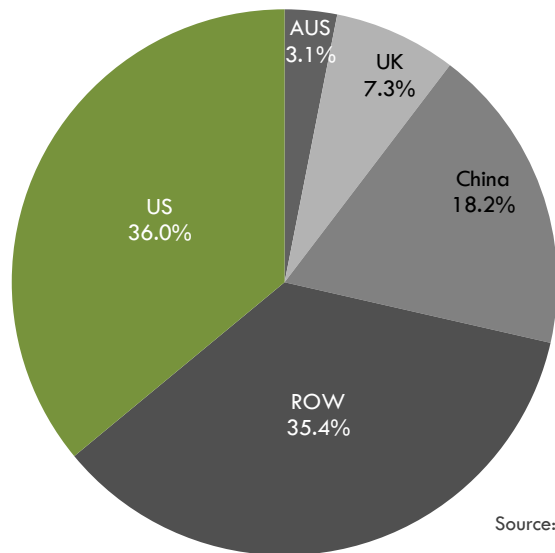
Global Smart Appliance Geographic Sementation 2011



From 2011 to 2015, the global household smart appliance market is projected to grow from \$3.06 billion to \$15.12 billion, respectively. The compound annual growth rate (CAGR) from 2011 to 2015 is projected to be 49.0 percent.

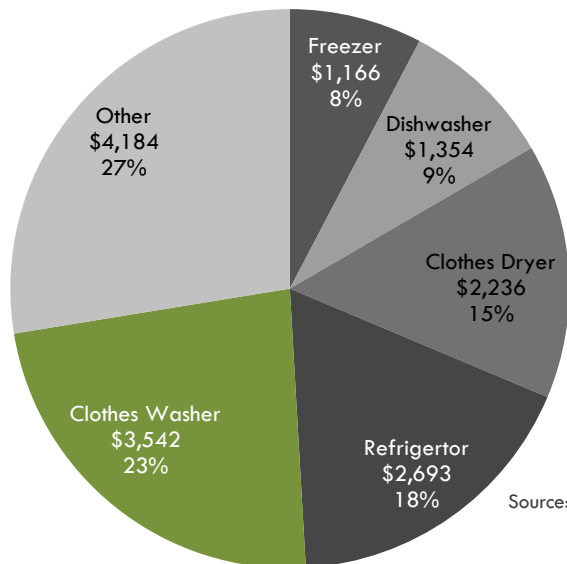
- In 2011, the US is projected to dominate the household smart appliance market, accounting for 46.6 percent (\$1.43 billion) of the global market. In 2015, the US market share is projected to decrease to 36.0 percent (\$5.46 billion) of the global household smart appliance market.
- In 2011, China is expected to follow the US with a market share of 11.6 percent (\$355 million). In 2015, China is projected to account for 18.2 percent (\$2.76 billion) of the global household smart appliance market.
- In 2011, the UK and Australia are projected to account for 4.8 percent (\$146.0 million) and 2.8 percent (\$87.0 million) of the global household smart appliance market. In 2015, the UK and Australia are projected to account for 6.4 percent (\$969.0 million) and 3.1 percent (\$470.0 million) of the global household smart appliance market.
- The rest of world (ROW) is expected to account for 34.2 percent (\$1.05 billion) of the global household smart appliance market in 2011. In 2015, ROW is projected to account for 36.3 percent (\$5.51 billion) of the global household smart appliance market.

Global Smart Appliance Geographic Sementation 2015



Source: Zpryme

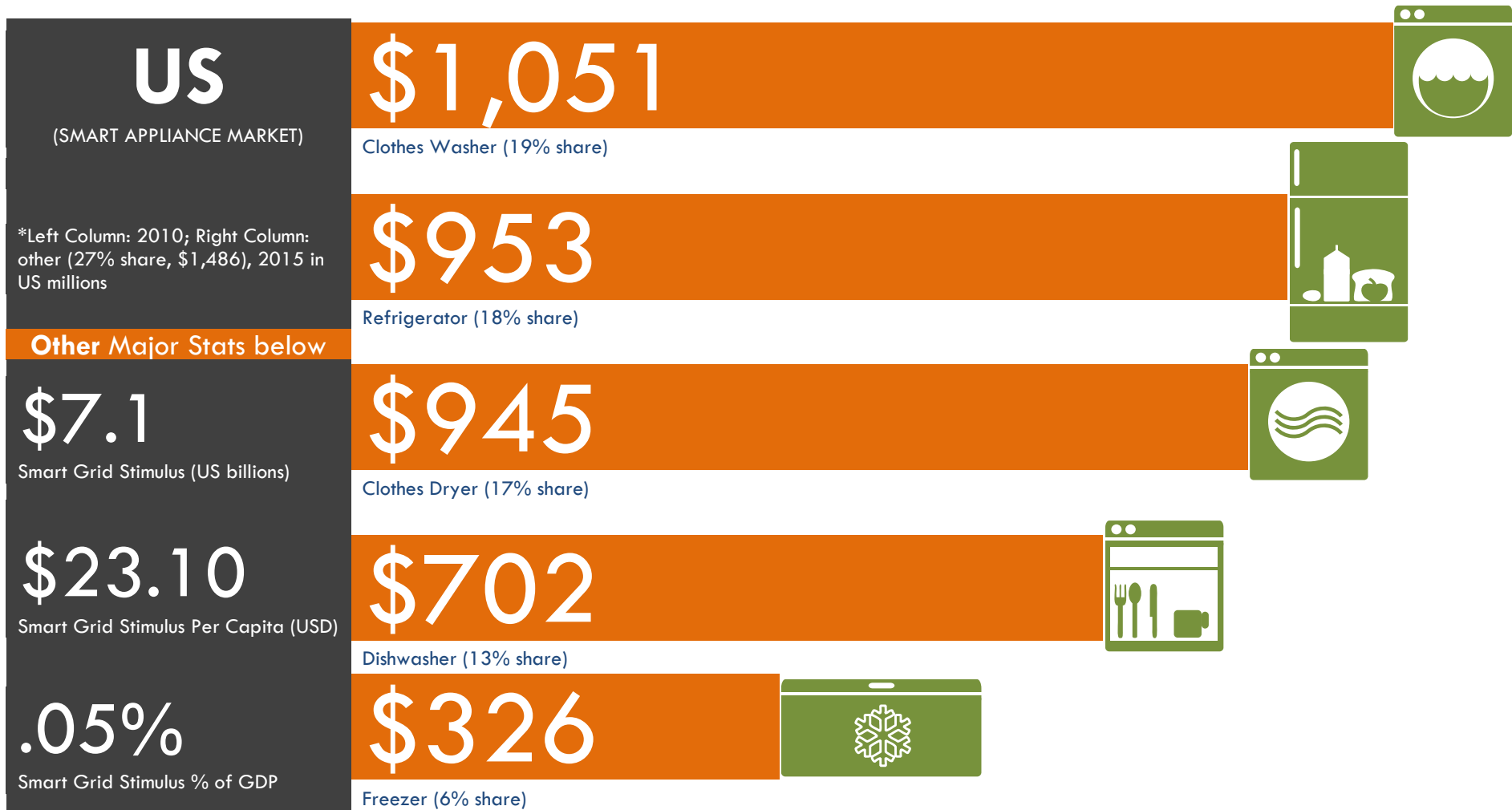
Projected Global Smart Appliance Product Sementation 2015 | (US millions)



Source: Zpryme

In 2015, the majority of global smart appliance sales are projected to comprise of smart washers, smart refrigerators, and smart clothes dryers. These 3 products will account for 58.8 percent or \$8.47 billion of the global household smart appliance sales in 2015.

- In 2015, sales of smart washers are projected to reach \$3.54 billion and account for 23.3 percent of the global household smart appliance market. Among the appliances covered in this report, smart washers are projected to rank 1st in market value in 2015.
- In 2015, sales of smart refrigerators are projected to reach \$2.69 billion and account for 17.7 percent of the global household smart appliance market. Among the appliances covered in this report, smart refrigerators are projected to rank 2nd in market value in 2015.
- In 2015, sales of smart dryers are projected to reach \$2.23 billion and account for 11.4 percent of the global household smart appliance market. Among the appliances covered in this report, smart dryers are projected to rank 3rd in market value in 2015.
- In 2015, sales of smart dishwashers are projected to reach \$1.35 billion and account for 8.9 percent of the global household smart appliance market. Among the appliances covered in this report, smart dishwashers are projected to rank 4th in market value in 2015.
- In 2015, sales of smart freezers are projected to reach \$1.16 billion and account for 7.7 percent of the global household smart appliance market. Among the appliances covered in this report, smart freezers are projected to rank 5th in market value in 2015.
- In 2015, sales of 'other' smart appliances are projected to reach \$4.18 billion and account for 27.6 percent of the global household smart appliance market.



Smart Grid Cloud

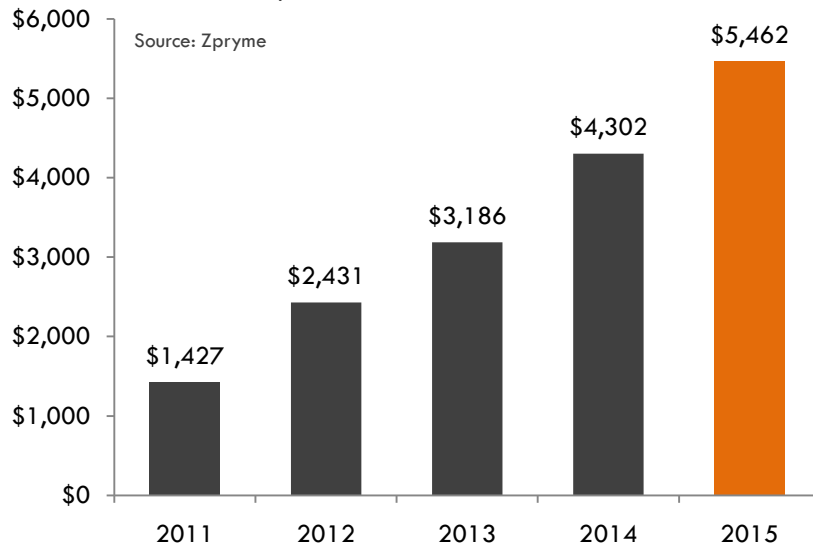
The **FCC** is specifically asking which private and public networks and technologies are best suited to be used for Smart Grid applications, with an eye toward the bandwidth, latency, reliability and coverage requirements for various Smart Grid applications. **Silver Spring Networks Inc.** is planning an IPO for the middle of the year. The **Obama administration** directed \$3.4 billion USD in stimulus funds to 100 Smart Grid projects in 2009, and requested \$144 million USD in its fiscal 2011 budget for grid modernization. **Google** finally won approval from the Federal Energy Regulatory Commission (FERC) to be an electric utility. **IBM** is working with utilities worldwide on 60 Smart Grid pilot projects, about half of which are in the US. **PG&E** has installed 4.7 million of the world's 76 million advanced metering devices in use. **Ford Motor Company** and **Progress Energy** are expanding their plug-in vehicle research partnership to include the utility company's Florida operations -- Ford plans to bring a plug-in hybrid electric vehicle to market in 2012 as part of its electrification product strategy. The Japanese government (**NEDO**) expects to invest \$30 million over four years in smart grid research and demonstration projects in New Mexico.

US Market

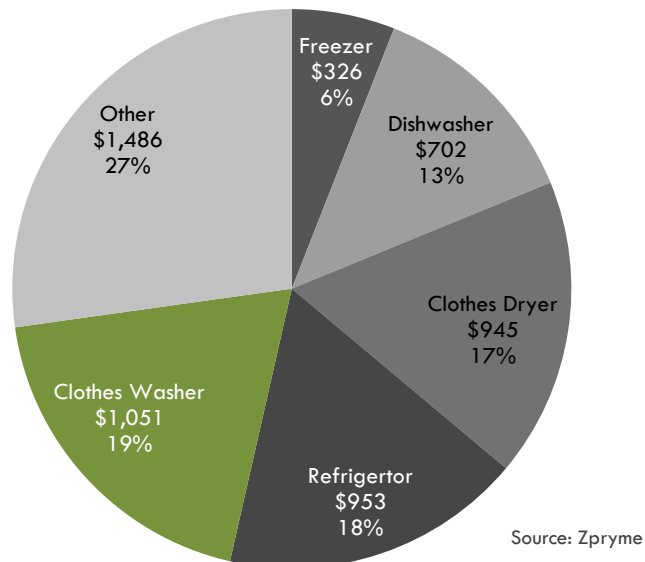
From 2011 to 2015, the US household smart appliance market is projected to grow from \$1.42 billion to \$5.46 billion, respectively. The US compound annual growth rate (CAGR) from 2011 to 2015 is projected to be 40.0 percent.

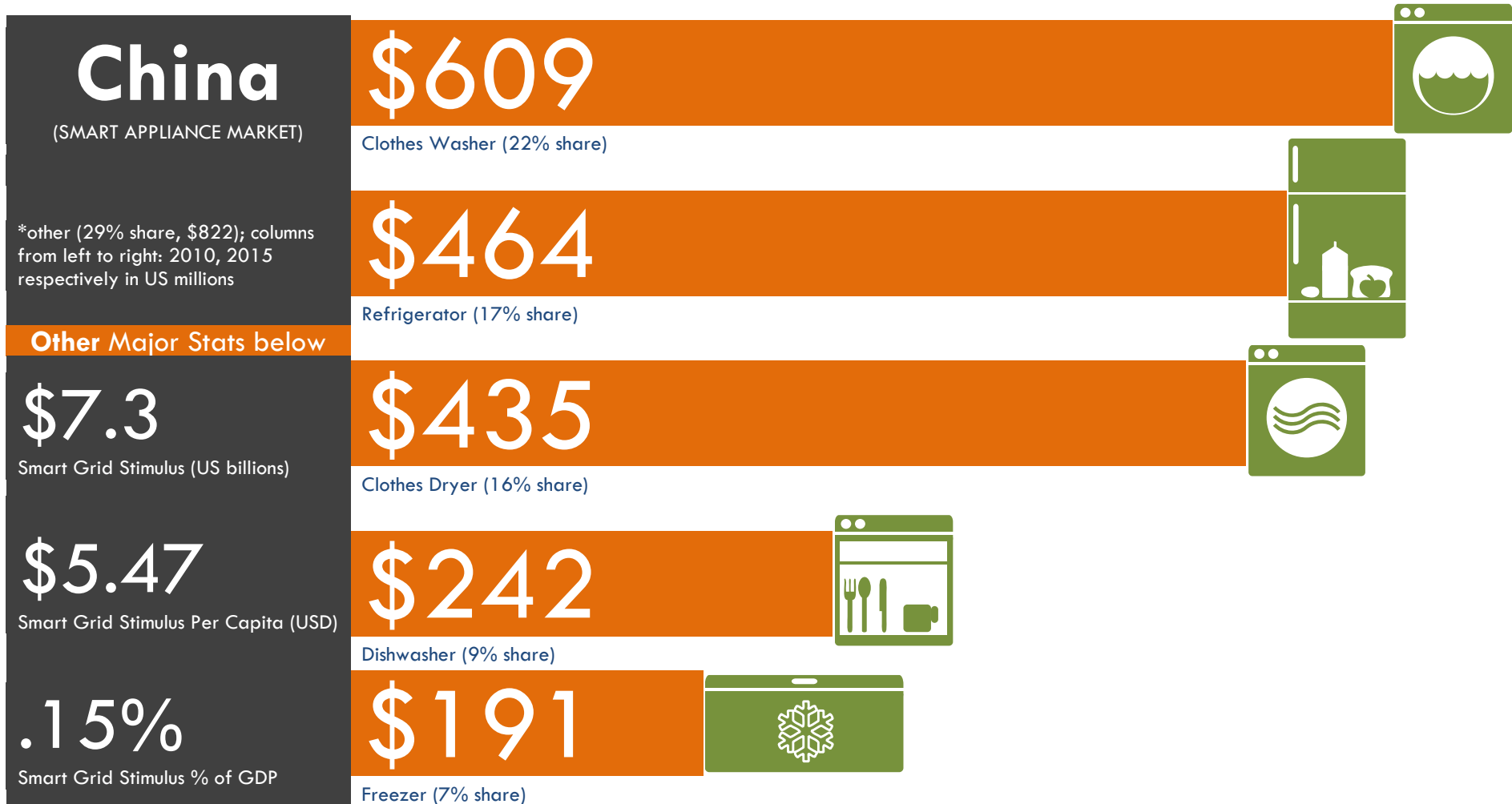
- In 2015, sales of smart washers are projected to reach \$1.05 billion and account for 19.2 percent of the US household smart appliance market.
- In 2015, sales of smart refrigerators are projected to reach \$0.95 billion and account for 17.4 percent of the US household smart appliance market.
- In 2015, sales of smart dryers are projected to reach \$0.94 billion and account for 17.3 percent of the US household smart appliance market.
- In 2015, sales of smart dishwashers are projected to reach \$0.70 billion and account for 12.8 percent of the US household smart appliance market.
- In 2015, sales of smart freezers are projected to reach \$0.33 billion and account for 6.0 percent of the US household smart appliance market.
- In 2015, sales of 'other' smart appliances are projected to reach \$1.49 billion and account for 27.2 percent of the US household smart appliance market.

Projected US Smart Appliance Market Value
2011 - 2015 | (US millions)
Compound Annual Growth Rate = 40%



Projected US Smart Appliance Product Sementation
2015 | (US millions)





Smart Grid Cloud

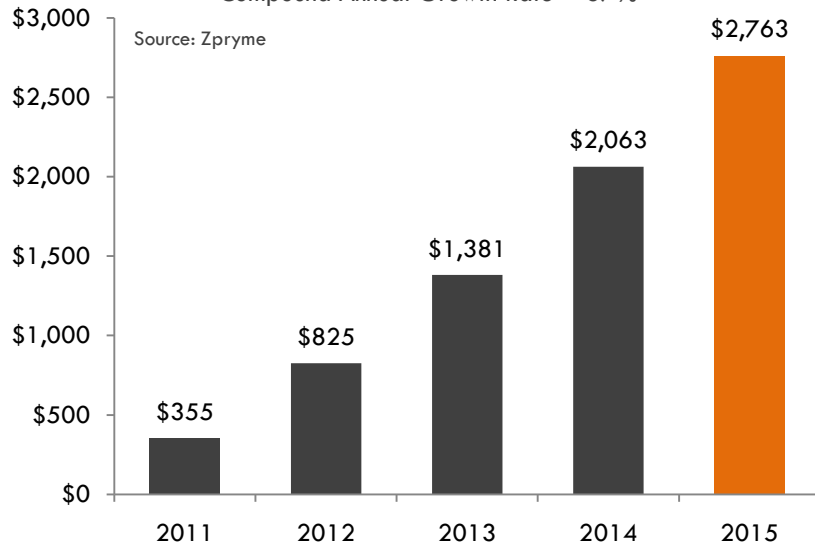
China has been developing communication and technical protocols far faster than any other nation, **State Grid Corp of China**, the nation's largest power supplier (80% share), will soon start the construction of the country's first Smart Grid project in North China's Tianjin. **BYD** (10 percent owned by Berkshire Hathaway) will invest \$3.30 billion USD over five years to build China's largest solar power battery plant. **GE** will partner with China's City of Yangzhou (pop. 4m) to build a Smart Grid "demonstration center". **IBM** (will generate a minimum of \$400 million USD in Smart Grid revenues), **Hewlett-Packard**, **Cisco** and **Accenture**, and **Itron** are all developing Smart Grid-related technology and infrastructure in China. **Prudent Energy** (China's JD Holdings) has raised \$22 million USD to build out its Beijing manufacturing capacity for vanadium redox flow batteries and to accelerate the company's growth in other markets like the US. **IBM** also made public its Energy & Utilities Solutions Lab in Beijing at the beginning of March 2010.

China Market

Projected China Smart Appliance Market Value

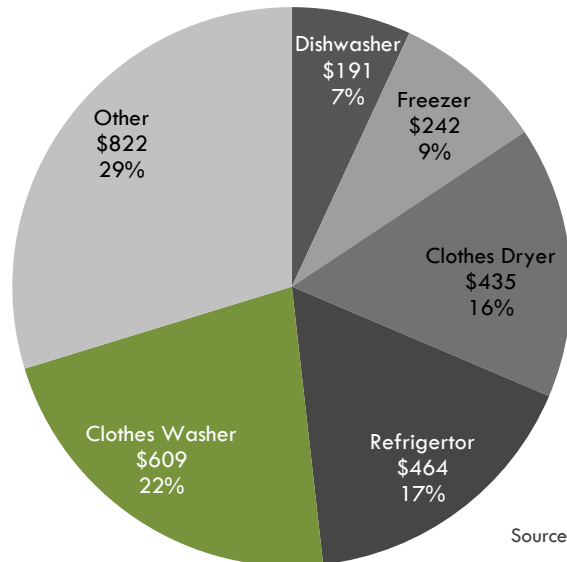
2011 - 2015 | (US millions)

Compound Annual Growth Rate = 67%



Projected China Smart Appliance Product Sementation

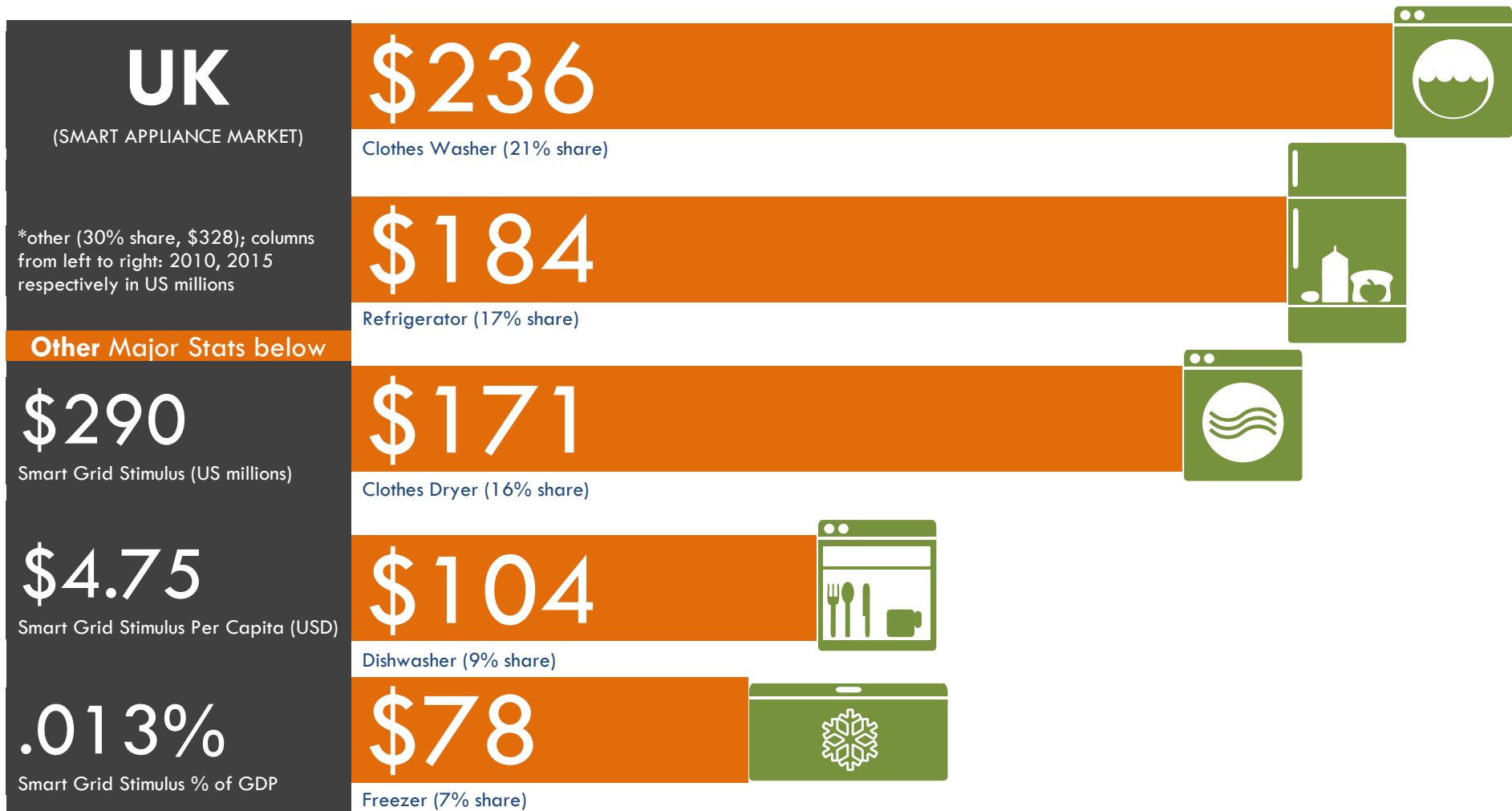
2015 | (US millions)



Source: Zpryme

From 2011 to 2015, the China household smart appliance market is projected to grow from \$0.36 billion to \$2.76 billion, respectively. China's compound annual growth rate (CAGR) from 2011 to 2015 is projected to be 67.0 percent.

- In 2015, sales of smart washers are projected to reach \$609.1 million and account for 22.0 percent of the China household smart appliance market.
- In 2015, sales of smart refrigerators are projected to reach \$464.3 million and account for 16.8 percent of the China household smart appliance market.
- In 2015, sales of smart dryers are projected to reach \$435.0 million and account for 15.7 percent of the China household smart appliance market.
- In 2015, sales of smart freezers are projected to reach \$241.8 million and account for 8.8 percent of the China household smart appliance market.
- In 2015, sales of smart dishwashers are projected to reach \$190.8 million and account for 6.9 percent of the China household smart appliance market.
- In 2015, sales of 'other' smart appliances are projected to reach \$821.7 million and account for 29.7 percent of the China household smart appliance market.



Smart Grid Cloud

Software AG is partnering with Siemens to support the UK Government's Smart Grid and metering initiatives. The **UK Government** has set a target date of 2020 for installing smart meters in over 26 million homes country-wide. **Siemens** and **Software AG** have developed a demonstration with partners **Electralink** and **eMeter** to show how a central communications gateway can provide access to, and control of, smart meters. Power providers can use ElecraLink's interim solution - the Smart Interoperability Portal - to start using smart meters immediately. According to Verdantix, between 2009 and 2013 the fastest growing segments in the UK will be **Smart Grid (31% CAGR)**, carbon data collection and management (28%), clean-tech R&D (26%), electric vehicles and infrastructure (24%) and sustainable product development (23%). **Horizon Energy Cooperative (HEC)** plans to create a grid that encompasses around 125,000 houses, which could collectively generate up to 250MW in power (three year pilot).

UK Market

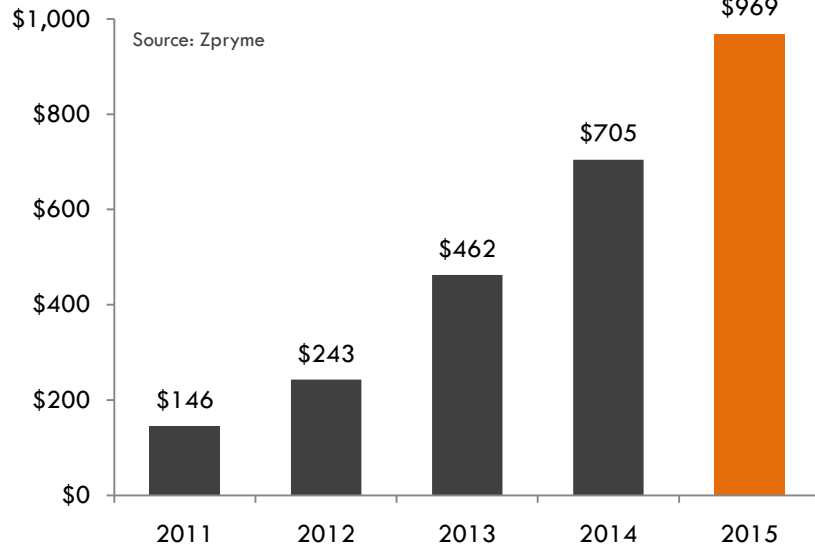
From 2011 to 2015, the UK household smart appliance market is projected to grow from \$146.0 million to \$969.0 million, respectively. The UK compound annual growth rate (CAGR) from 2011 to 2015 is projected to be 61.0 percent.

- In 2015, sales of smart washers are projected to reach \$207.9 million and account for 21.5 percent of the UK household smart appliance market.
- In 2015, sales of smart refrigerators are projected to reach \$161.7 million and account for 16.7 percent of the UK household smart appliance market.
- In 2015, sales of smart dryers are projected to reach \$150.7 million and account for 15.6 percent of the UK household smart appliance market.
- In 2015, sales of smart freezers are projected to reach \$91.5 million and account for 9.4 percent of the UK household smart appliance market.
- In 2015, sales of smart dishwashers are projected to reach \$68.6 million and account for 7.1 percent of the UK household smart appliance market.
- In 2015, sales of 'other' smart appliances are projected to reach \$288.5 million and account for 29.7 percent of the UK household smart appliance market.

Projected UK Smart Appliance Market Value

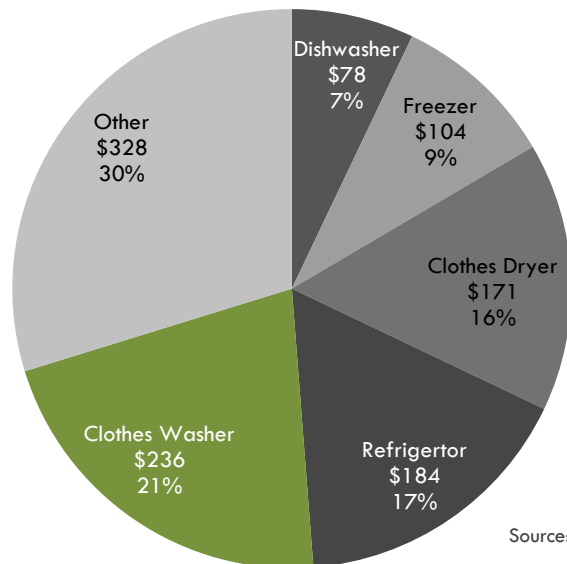
2011 - 2015 | (US millions)

Compound Annual Growth Rate = 61%

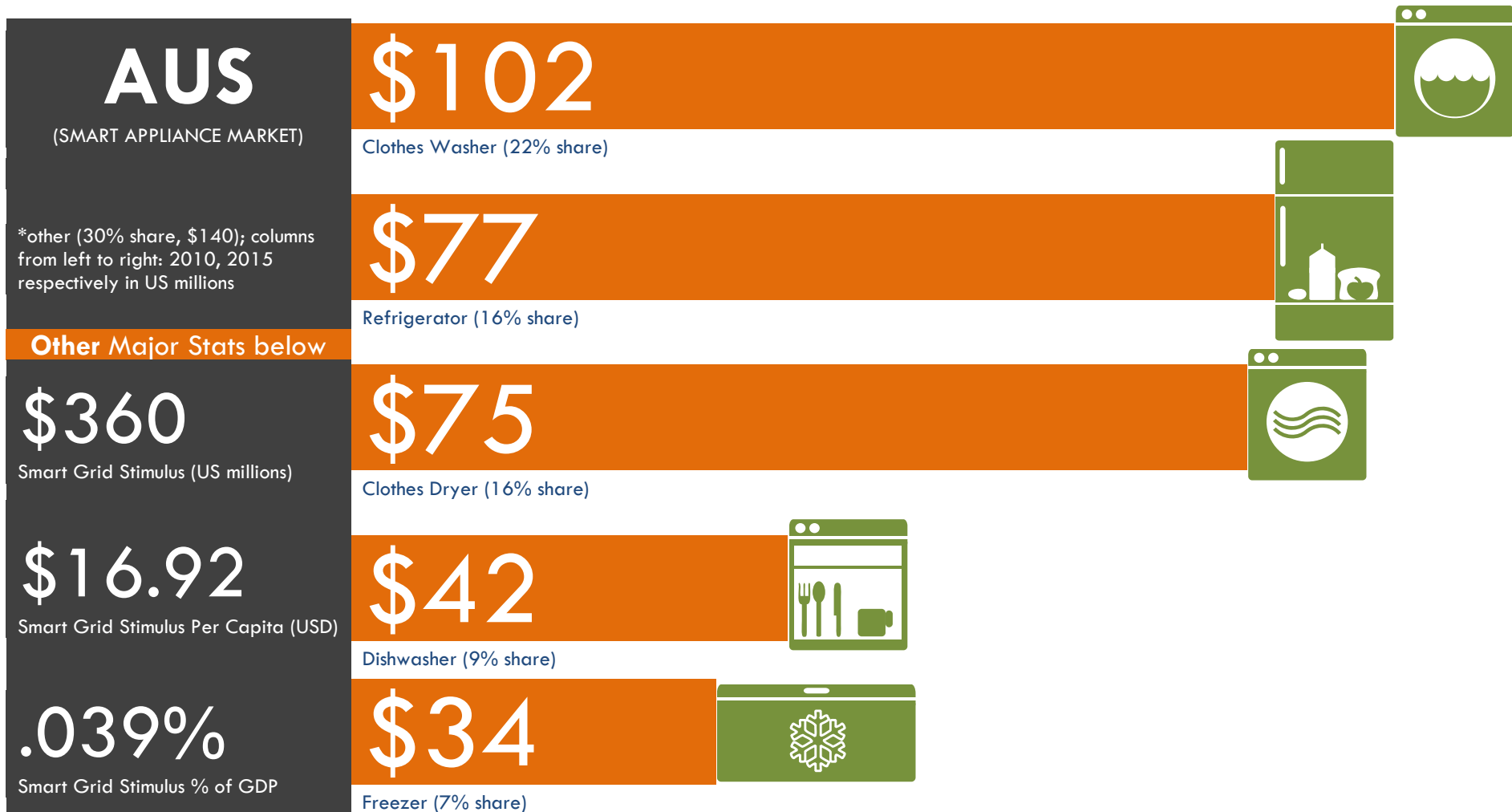


Projected UK Smart Appliance Product Sementation

2015 | (US millions)



Source: Zpryme



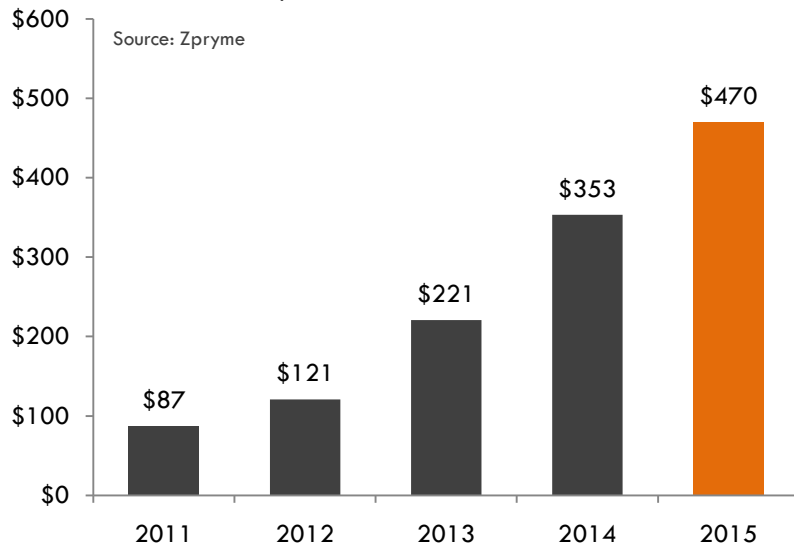
Smart Grid Cloud

KEPCO announced that it had submitted a bid for a 100-billion-won pilot project to test a Smart Grid system over the next three years in Australia. The \$100 million USD Smart Grid/Smart City project (i.e. **National Energy Efficiency Initiative – NEI**) - the aim is to link 9,500 homes to a Smart Grid during the period 2010-2013 (the project will become the blueprint for a national rollout). Led by **United Energy, Jemena, AGL** and **Accenture**, the Victorian State government has thrown its support behind the Frankston Smart Grid, Smart City project in an effort to secure up to \$100 million in Federal Government funding. Sydney's former Olympic Village will go from housing gold medalists to the energy-fit when it becomes Australia's first Smart Village in a two-year trial (created in Newington and Silverwater in a trial by **EnergyAustralia** and **Sydney Water** to help 1,000 households reduce their utility bills and carbon impact). **Grid Net** recently launched its first utility project (WiMAX-enabled smart meters and underlying software) in Australia.

Projected Australia Smart Appliance Market Value

2011 - 2015 | (US millions)

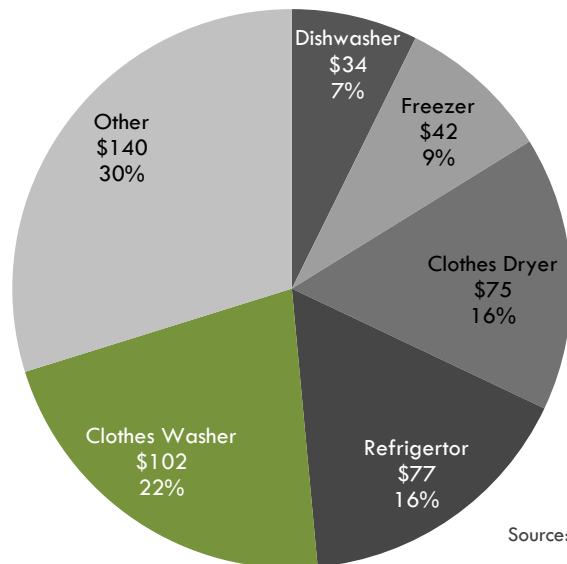
Compound Annual Growth Rate = 52%



Source: Zpryme

Projected Australia Smart Appliance Product Sementation

2015 | (US millions)



Source: Zpryme

Australia Market

From 2011 to 2015, the Australia household smart appliance market is projected to grow from \$87.0 million to \$470.0 million, respectively. Australia's compound annual growth rate (CAGR) from 2011 to 2015 is projected to be 52.0 percent.

- In 2015, sales of smart washers are projected to reach \$101.8 million and account for 21.7 percent of the Australia household smart appliance market.
- In 2015, sales of smart refrigerators are projected to reach \$77.4 million and account for 16.5 percent of the Australia household smart appliance market.
- In 2015, sales of smart dryers are projected to reach \$74.5 million and account for 15.6 percent of the Australia household smart appliance market.
- In 2015, sales of smart freezers are projected to reach \$41.7 million and account for 8.9 percent of the Australia household smart appliance market.
- In 2015, sales of smart dishwashers are projected to reach \$34.3 million and account for 7.3 percent of the Australia household smart appliance market.
- In 2015, sales of 'other' smart appliances are projected to reach \$140.0 million and account for 29.8 percent of the Australia household smart appliance market.



Smart Appliances: A Closer Look

The Consumer is King

Smart Appliance Drivers & Trends

Spotlight: GE, Whirlpool, & U-Snap

The Role of Smart Grid Integrators

The Role of Utilities

The Role of Appliance Manufacturers

Insights

Opportunities

The Consumer is King



From the environmental-benefits of the Smart Grid to protecting their privacy what's ultimately central and imperative for consumers to 'opt-in' and purchase smart appliances is Smart Grid education.

Everywhere consumers read, watch or shop there seems to be a proliferation of eco-friendly news, yet where is the Smart Grid? More than ever, consumers understand the environment and feel the impact of increasing energy costs. Consumers expect corporations and the government to show their commitment to the environment through direct action. Companies like GE, IBM, and Cisco are at the forefront of consumer education and websites like smartgrid.gov (US), decc.gov.uk (UK), and environment.gov.au (Australia) offer important resources to its residents. As do organizations such as the GridWise Alliance (US) JUCCCE (China), and US federal agency NIST - however this is not even scratching the surface of educating consumers about Smart Grid benefits.^{5, 6}

Actually, a recent study conducted by the Yale School of Forestry and Environmental Studies indicates that Americans are significantly more likely to encourage environmental responsibility with dollars than with votes or phone calls to legislators. "It's a little bit disconcerting to me that Americans are more comfortable expressing their preferences as consumers than as citizens," said Edward Maibach, MPH, PhD.^{7, 8}

Smart grid 'infancy stage' or not, both the private and public sector must zero-in on the consumer now - consumer education is an integral

⁵ NIST (National Institute of Standards and Technology) is a non-regulatory federal agency within the US Department of Commerce that develops and promotes measurement, standards, and technology.

⁶ JUCCCE (Joint US-China Collaboration on Clean Energy) is a non-profit organization that brings together international expertise and technologies to accelerate the use of clean and efficient energy in China.

⁷ Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2010) *Americans' Actions to Conserve Energy, Reduce Waste, and Limit Global Warming: January 2010*. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change.

⁸ Their, Dave. *Survey: Americans Believe in Going Green -- They Just Don't Do It*. AOL News. Web. 18 Feb. 2010.

component and the key to the Smart Grid succeeding. The technology is here, solid standards are around the corner, and governments are offering their full-support – so what must be done?

Government Advocacy:

Governments must do more to inform their citizens not only about the long term affects of saving the environment, but more notably the money saving opportunities of transitioning to the Smart Grid – and have to talk to consumers repeatedly and get the messages out there by advocating at both a national and grassroots level. Also, get the consumer involved – active participation of consumers is essential for making the Smart Grid successful.

Corporate Responsibility & Marketing:

Corporations must partner together with their government to better understand and engage consumers. Initiatives like 'Cash for Appliances' in the US can stimulate the industry momentarily, though educating consumers about why they are paying a premium for a smart appliance must be addressed to maintain momentum and arouse growth in the long term.⁹ Traditional marketing alone can't assist companies to address these 'education initiatives', as decision-makers need practical 'consumer insights' for campaigns, not reams of data.

Smart Appliance Drivers & Trends

For many global economies, the deployment of the Smart Grid could easily be one of the leading drivers of wealth well into the next 10 to 15 years. Consequently, even in its infancy stage, countless companies are chomping at the bit to figure out the best way to enter this moving-at-the-speed-of-broadband industry. The smart appliance segment is echoing similar sentiment with two major players GE and Whirlpool galloping full stride into this space; however there is plenty of room in the appliance market to capitalize on - identifying consumer drivers

⁹ 'Cash for Appliances', backed by an initial \$300 million in funding from the American Recovery and Reinvestment Act, the state-run rebate program is intended to help make American homes more energy-efficient while further stimulating the economy.

and trends early in the game is paramount for the next industry-shifters i.e. emerging start-ups.

Appliance Drivers:

What is going to drive this [smart appliances] relatively untapped space is: affordably across the mainstream, “doing the right thing” for the environment, energy efficiency, build-out of Smart Grid infrastructure and government subsidies:

- **Pricing:** Bringing smart appliances to the mainstream means aligning ecological innovation with affordability. “If we really want to drive consumer behavior we have to have pricing mechanisms that encourage us to change.” Bob Gilligan, GE’s Vice President of Transmission and Distribution told a conference on the future of cities at Chatham House.¹⁰
- **Environment:** With the build-out of metering and real-time pricing consumers will see the economic and more importantly environmental incentives for reducing power consumption first hand with their smart appliances.
- **Energy efficiency:** When a consumer buys an appliance, they commit to paying both the first cost and the operating cost for the life of the product. And over the existence of the appliance, the energy cost to run it could be exponentially greater than the initial cost. Thus, the message, “it pays to buy an energy-efficient appliance (i.e. smart appliance)” must be conveyed to consumers.
- **Smart grid build-out:** Smart appliance growth relies heavily on how quickly Smart Grid infrastructure can be rolled-out and readily accessible to communities.
- **Government subsidies:** Like the “Cash for Appliances” program in the US, governments must play an active role in pushing the smart appliance agenda. This driver will be critical to the overall success

¹⁰ Reuters. *Pricing seen as ultimate driver of greener energy use.* Web. 11 Feb. 2010.

of these products and ultimately the sustainability of the Smart Grid ecosystem.

Appliance (Large) Trends:



What space will drive the most growth... driven by GE and Whirlpool, consumers will initially aim to purchase larger appliances such as refrigerators, dishwashers, clothes washers and dryers, and stoves/ovens.

Consumers want to see immediate results and with appliances such as the refrigerator, which consumes almost five times the electricity the average television uses and could make up more than 10% of a home utility bill, that’s easy to understand.¹¹

The Earlier the Better:

Identifying these drivers now will assist companies to develop compelling ‘brand’ messages to promote sales of smart appliances.

Spotlight: GE, Whirlpool, & U-Snap

The future of energy consumption in the United States lies in smart appliances – and at the helm are GE, Whirlpool, and U-Snap.

GE:

This past November 2009 GE began distributing a type of hot water heater that can link into the smart electric meters— the first such “smart appliance” sold commercially in the US.

Even earlier in October GE initiated a landmark pilot program in Masdar City (Abu Dhabi, UAE) – in the efforts to make it the world’s first carbon neutral, zero waste city being built in the UAE’s capital of Abu Dhabi. GE specifically designed and manufactured the appliances and networks for this pilot with equipment installation scheduled for early 2010.

¹¹ US Department of Energy. Web. *Appliances.* 2010.

Further, as more stimulus applications are approved, GE Smart Grid enabled appliances are rapidly moving towards the consumer. One month later in November 2009, GE (awarded \$20 million in stimulus funds) and Reliant Energy partnered to test GE smart appliances as part of a home-based smart energy program. GE smart appliances installed by Reliant will be: refrigerators, dishwashers, ranges, microwaves, clothes washers and dryers and hybrid water heaters.

Also, GE's Consumer & Industrial division plans to manufacture high-end energy-efficient front-load washers and dryers at GE's Appliance Park facility in Louisville, Kentucky, US, beginning in 2012. GE has been working with the Kentucky Cabinet for Economic Development and the Metro Louisville government on a package of economic development incentives to encourage the company to expand the Appliance Park operation to increase employment and economic development opportunities in the region. The washing machine would go into production in 2012 and the new dryer in 2013. Steam technology, specialty fabric cycles, advanced vibration-reduction technology and washer-dryer communication will deliver great performance and convenience for the consumer.¹²

Lastly, GE currently has a smart appliance pilot program with Louisville Gas & Electric (LG&E) that has been in place for more than a year. Those participating in the program have found that by changing some day-to-day behaviors while taking advantage of smart appliance features they have saved as much as a 20% on their utilities.

Whirlpool:

In 2006, Whirlpool Corporation was the first appliance company to conduct a Smart Grid pilot, using 150 Smart Energy dryers in the Pacific Northwest. Whirlpool created and holds key patents for this type of technology.¹³

By the end of 2011, Whirlpool has committed to producing one million Smart Grid-compatible clothes dryers. By 2015, the company will

make all of its electronically controlled appliances capable of receiving and responding to signals from Smart Grids.

Before Whirlpool plans to ship millions of smart grid enable appliances in the years leading up to 2015, the manufacturer will initiate a 40-home pilot in Houston to study the Smart Grid consumer behavior - the pilot will be conducted jointly with Direct Energy, Lennox, Best Buy and OpenPeak.

The pilot is the first of its size and scope at Whirlpool. An earlier test in the Northwest of the United States in 2006 involved just dryers (Whirlpool plans on a 200 home pilot in Michigan later this year).

For the Houston pilot, Whirlpool will replace the washers, dryers, dishwashers, refrigerators and water heaters at the 40 homes with products designed to communicate over a network. It also will install an energy monitor so that people can keep track of and adjust energy use. The monitor is to be connected to the Internet and will let people also watch movies and fetch info.¹⁴

U-Snap:

The U-SNAP Alliance gained broad industry support for its universal communication interface by signing liaison agreements with EnOcean Alliance, HomeGrid Forum and the Z-Wave Alliance. These agreements are expected to result in a wider range of solutions for consumers and utilities to connect appliances and consumer electronics to smart meters.

The U-SNAP Alliance enables interoperability between multiple wireless and wired communication technology options, supporting the deployment of 'best-of-breed' Smart Grid solutions. Rather than force manufacturers to build and integrate thermostats for each communication protocol deployed, why not offer a simple circuit card that can be "plugged" or "snapped" into a thermostat to connect it to the native AMI network? That way, when one state or utility adopts protocol A and another adopts protocol B, manufacturers and retailers

¹² www.geconsumerandindustrial.com

¹³ www.whirlpool.com

¹⁴ TechPulse360. *Whirlpool and Direct Energy Plan Smart Appliance Trial In Houston*. Web. 8 Jan. 2010.

can offer the same exact product in multiple markets. The same standard for thermostats can be applied to other HAN devices such as in-home displays, load control modules, plug-in electric vehicles, solar energy systems and even kitchen appliances.¹⁵

The Role of Smart Grid Integrators

Seamless integration across the Smart Grid ecosystem is the key to turning the Smart Grid vision into a tangible reality for related stakeholders and electricity customers. Integrators must communicate with utilities and smart appliance manufactures in regard to developing smart appliance standards, knowledge transfer, efficiency testing, and the optimization of systems and networks that communicate with smart appliances.

For consumers, full integration into the Smart Grid means they can purchase smart appliances that deliver legitimate cost savings and environmental benefits that don't require additional costs or effort to use. For appliance manufactures, full integration into the Smart Grid means they can design a variety of innovative smart appliances without jeopardizing their brand's integrity by selling a product to customers that has 'technical difficulties' or needs consistence maintenance.



Today, major companies like IBM, Cisco, Oracle, Silver Spring Networks, BPL Global, Ambient, Ventyx, Itron, SAP, and Siemens are designing, managing, and implementing Smart Grid integration projects across the globe.

These integrators are laying the foundation for Smart Grid optimization by enabling utilities to transfer and store data, communicate across multiple stakeholder platforms, manage the transmission and distribution of power, reduce peak power demand, and reduce dependence on more fossil-fuel power generation. Integrators further enable smart appliances and customers the ability to mitigate the impact of system wide disturbances and power price increases during peak power periods.

¹⁵ www.usnap.org

The Role of Utilities

With respect to smart appliances, utilities are charged with building the Smart Grid infrastructure that will let consumers fully reap the benefits of smart appliances.



The one thing appliance manufactures do not want is a warehouse full of smart appliances that can't be sold because the Smart Grid infrastructure has not materialized in conjunction with appliance production.

This is not an easy feat as utilities are already under enormous financial pressure to cut operational costs and reduce electricity costs for their customers. Additionally, the majority of utilities will fund Smart Grid projects through rate increases that will be directly felt by their customers. This task is further exasperated by the fact that utility customers will not be able to realize the costs savings from the Smart Grid until a few years after the Smart Grid project is undertaken by their respective utility.

Currently, utilities such as Pacific Gas & Electric, American Electric Power, British Gas, SP AusNet, and the State Grid Corporation of China are taking the lead in developing the Smart Grid in their respective countries. However, utilities that currently have Smart Grid projects underway must ensure the timely and successful implementation of the each project from start to finish. Delays and budget overruns in Smart Grid projects will only bring more anguish to customers and increase the level of difficulty for utilities to approve and fund future Smart Grid projects.

Utilities Leading the Smart Grid Movement
(US, China, UK, and Australia)

Utility	Country	Smart Grid/Meter Projects Underway
PG&E	US	Smart meter program started in 2006 and 9.8 million smart meters expected to be installed by the end of 2011
AEP	US	Smart meter program launched in 2008 with a goal of 5.0 million smart meters installed by the end of 2015 (goal of 1.0 million installed by the end of 2010)
SGCC	China	Three phase roll out of \$106.2 billion investment from 2009 to 2020 in Smart Grid technologies such as smart meters, intelligent information platforms, dispatching and substation automation systems, and acquisition management systems
British Gas	UK	Started with 50,000 home smart meter trial in 2008 then announced roll out of 17.0 million smart meter installations by the end of 2012 in October of 2009
SP AusNet	Australia	Smart meter rollout of 680,000 installed by the end of 2013 (announced in January 2010)

Next, utilities will have to establish a working relationship with appliance manufactures and develop transparent agendas regarding their future plans to develop the Smart Grid with appliance manufactures. Appliance manufactures will not invest in new technologies and smart appliances if they are uncertain about the future development of the Smart Grid.

Finally, open communication platforms between utilities and appliance manufactures will allow the appliance manufactures to plan their smart appliance initiatives accordingly.

The Role of Appliance Manufactures

Smart appliances present appliance manufactures across the globe with a lucrative market opportunity, but appliance manufactures have plenty of work ahead of them if they want to see the smart appliance market significantly mature over the next five years. Below are five essential activities that appliance manufacturers can undertake to ensure the full development of the smart appliance industry.

1. Appliance manufacturers such as General Electric, Whirlpool, Electrolux, and Indesit are currently leading the smart appliance movement, but it will take a coordinated effort by large, medium sized, and small appliance manufactures to bring smart appliances to mainstream consumers across the globe. To accomplish this, appliance manufactures will have to first be willing to invest in the development of smart appliances. For larger appliance manufactures that have an abundance of resources this decision entails less risk compared to smaller firms who do not have the resources or access to capital to fund the development of smart appliances. Without medium sized and small appliance manufactures in the market, competition will be limited and thus price points on smart appliances will not be able to drop to ranges that are affordable by the average consumer.
2. Appliance manufacturers have to work closely with their peers, utilities, regulators, and Smart Grid integrators to ensure standards and technologies are in place to make sure the use of smart appliances are universal within a specific country, and hopefully across countries as well.
3. Appliance manufacturers are further tasked with driving innovation into their products, manufacturing processes, and business models to ensure that affordable smart appliances are developed for the average household in each of the respective markets their products are sold in.
4. Appliance manufactures will have to play a key role in educating and engaging consumers about the uses and benefits

of smart appliances. This will likely entail interactive promotional and educational programs directed at consumers across the globe. Some consumers may be more obliged to attend an in-store session at Wal-Mart or Home Depot while other consumers may be more responsive to interactive online programs.

Insights

Zpryme's Research Team identified these insights based on a comprehensive investigation of drivers, trends, opportunities and compelling events affecting the smart appliance industry

- Smart grid stimulus funds from the US, China, UK, and Australia will play a major role in developing the smart appliance market from an infancy to growth stage
- The market for household smart appliances outside the US will become significantly more lucrative after 2012
- China's household smart appliance market will be driven by grid investments from the State Grid Corporation of China and China's affluent and emerging middle class
- Combined, the UK and Australia household smart appliance markets will represent 9.5 percent of the total household smart appliance market in 2015
- Multinational appliance manufacturers will dominate the household smart appliance market from 2011 to 2015
- Household smart appliances will become more technologically advanced as overall grid integration increases across the world
- Smart appliances are only the first of many product lines to come that will increase grid efficiency and play a key role in lowering consumer electricity bills; eventually, computers,

printers, lights, vehicles, and other products will be able to fully integrate with the Smart Grid

- US and Australia consumer [smart appliance] adoption relies heavily on the amount of the initial purchase price as financial benefits in the long-term play a less significant role in a purchasing decision
- China and UK consumer [smart appliance] adoption relies heavily on the return on investment for the long-term rather than the amount of the initial purchase price
- When it's all said and done a collaborative effort must be made by the public and private sector to educate consumers on all the benefits of the Smart Grid

Opportunities

Zpryme's Advisory Team identified these 'forward-looking' opportunities based on an exhaustive exploration of the current gaps in the smart appliance landscape.

- Target geographic markets where smart meters currently exist and/or are planned to be rolled out
- Retailers (e.g. US: Best Buy; Australia: Myer; UK: Tesco; China: Wal-Mart) have new categories [small and large smart appliances] for growth to capitalize on
- Develop segmented smart appliance marketing strategies based on buyer demographics and preferences
- Develop smart appliances that are exclusively designed for the commercial and industrial sector
- Smart appliance manufacturers will experience an increase in demand for new technology, parts, and components; creating

an opportunity for industries that sell to appliance manufacturers (e.g. chip vendors, software developers)

- Target builders of pre-furnished homes, apartments, and condos as these types of firms may purchase smart appliances in bulk. Buildings of this nature also offer an enormous opportunity for smart meter companies such as Itron, EnerNOC and Converge
- Continually develop systems and software that empower consumers to manage their smart appliances, communicate with the grid and their utility, and lower their electricity costs
- Become a specialized (or niche) provider of integration products and solutions that enhance a utility's ability to connect and communicate with smart appliances
- Create a strategy to capitalize on the household smart appliance market in regions with a resilient middleclass (e.g. UK, US, Japan, Australia); growing middleclass (e.g. China, India)
- Rather than compete with the 'major-players', 'new-entrants' must focus on creating small household kitchen smart appliances rather than larger household smart appliances
- Considering this is virgin territory [smart appliance landscape], those that are quick to understand and engage future Smart Grid consumers i.e. 'griders' will be the first to capitalize¹⁶
- With developments such as GE producing network-capable power meters with Fuji Electric Holdings Co. in Japan, look for this nation's consumers to be the next market that is highly-receptive to the Smart Grid

¹⁶ Zpryme defines 'griders' as consumers that engage and interact with the Smart Grid and Smart Grid technologies.



Appendix

Appliance Cost Per Year in US (USD)

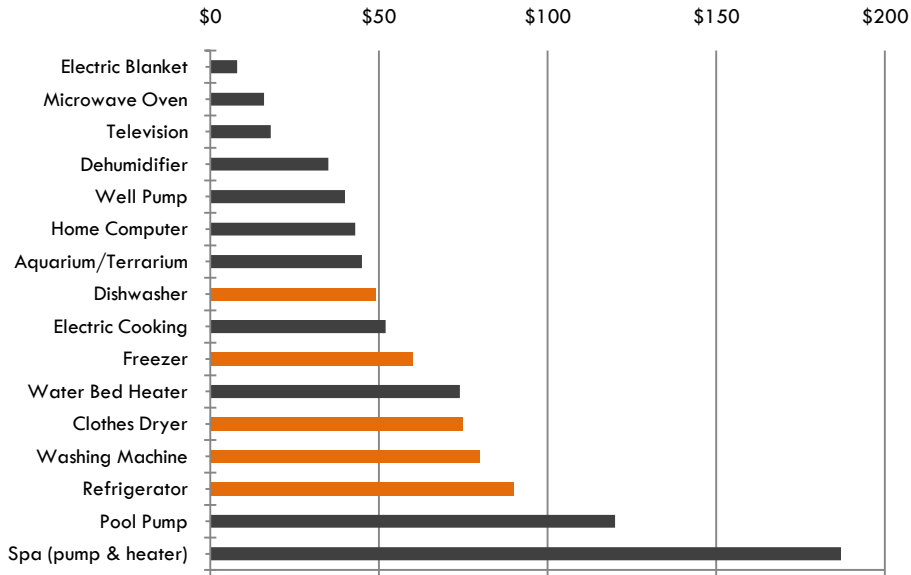


Figure 1 | Source: US Department of Energy

Top Ten Countries by Total Smart Grid Stimulus (US millions)

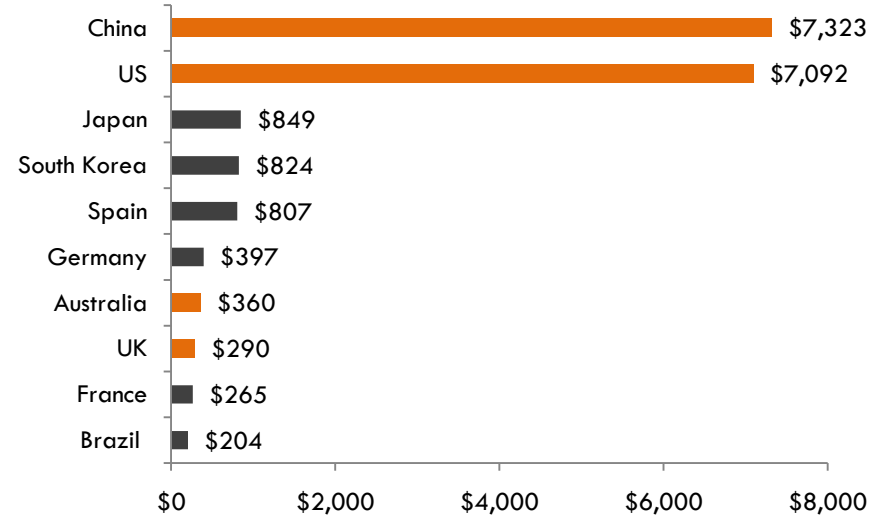


Figure 3 | Source: Zpryme

Smart Grid Stimulus % of GDP (top ten countries by total Smart Grid stimulus)

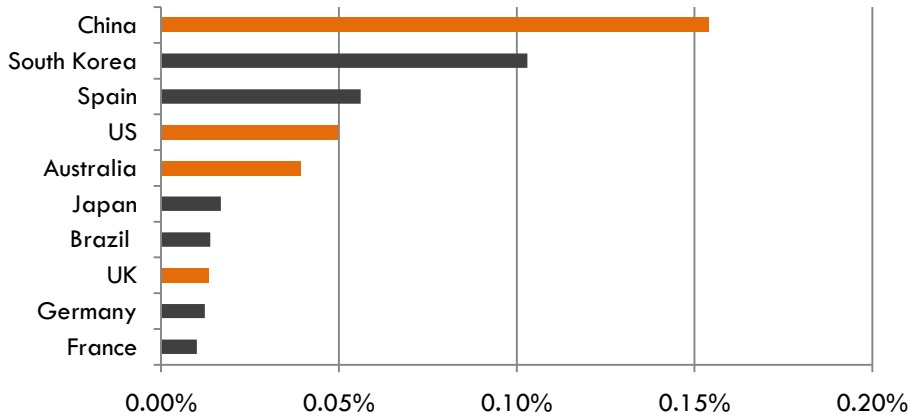


Figure 2 | Source: Zpryme

Smart Grid Stimulus Per Capita (top ten countries by total Smart Grid stimulus)

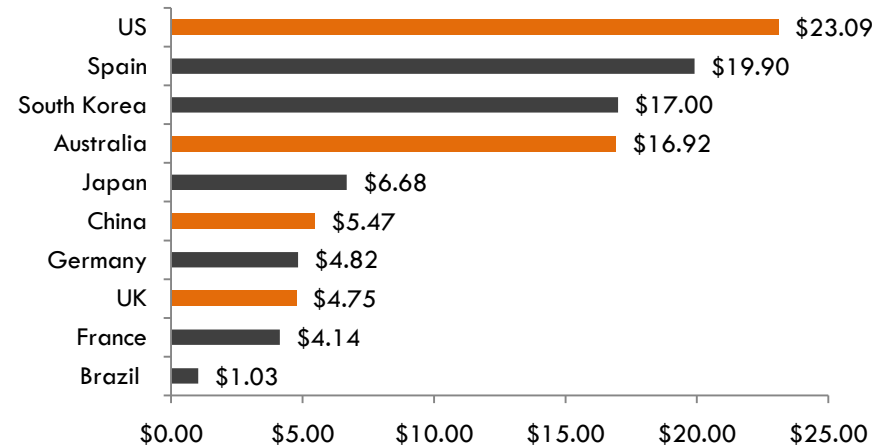


Figure 4 | Source: Zpryme

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