



RESEARCH REPORT

Executive Summary:

Electric Bicycles

Li-Ion and SLA E-Bikes: Drivetrain, Motor, and Battery
Technology Trends, Competitive Landscape, and
Global Market 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.

Published 2Q 2016

Ryan Citron

Research Analyst

John Gartner

Senior Research Director

Section 1

EXECUTIVE SUMMARY

1.1 Market Overview

Electric bicycles (e-bikes) continue to be the highest selling electric vehicle on the planet, with nearly 35 million unit sales forecast for 2016. Improving lithium ion (Li-ion) battery technology is resulting in e-bikes that are lighter, lower in cost, and remarkably similar to traditional bicycles. Additionally, increasing urbanization and a desire to move away from cars for motorized transportation are opening up more opportunities for alternative mobility devices. E-bikes are uniquely positioned to be a primary benefactor of this trend since they are low in cost relative to cars, do not require licensing, and can take advantage of existing bicycling infrastructure.

1.2 Regional Trends

The global e-bike market is well-positioned for continued growth, primarily in the Li-ion battery segment. Sealed lead-acid (SLA) batteries continue to represent the largest segment of e-bike sales due to their low cost and popularity in China. However, the market share of this chemistry is expected to decrease significantly over the next 10 years due to the inherent environmental and performance advantages of Li-ion batteries.

The e-bike industry is driven by high urbanization rates, improving battery technology and bicycling infrastructure, aggressive city energy policy, lower cost, and higher-performing product offerings. Nevertheless, low consumer awareness and gasoline prices, a lack of adequate bicycling infrastructure, and high purchase prices (compared to traditional bicycles) are still restricting sales in some markets.

Annual sales of total e-bikes in the world's largest market, China, are expected to decline due to market saturation and new bans on e-bike use in large areas of major cities such as Beijing, Shenzhen, Shanghai, and Guangzhou. Yet, the Li-ion e-bike market in China is expected to grow considerably over the forecast period due to strong government support for the technology and decreasing Li-ion battery costs.

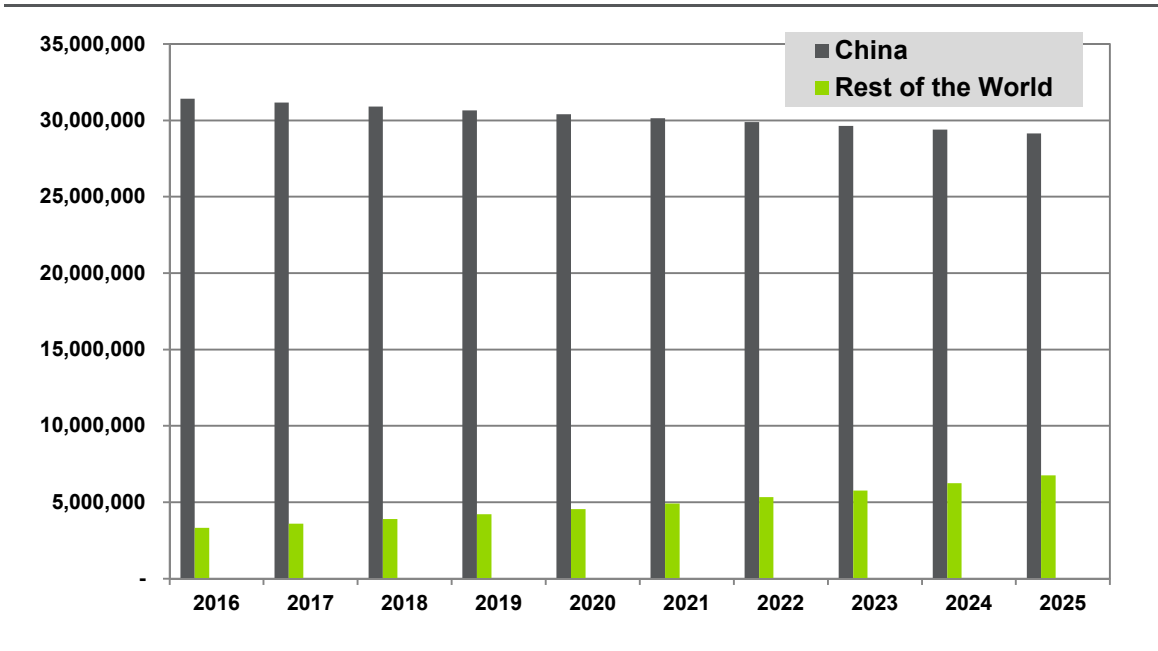
Western Europe continues to achieve steady and significant growth in e-bike sales, with Germany alone accounting for 535,000 unit sales in 2015 (compared to 480,000 in 2014 and 410,000 in 2013). During the next 10 years, e-bikes in the region are expected to evolve from a specialty commuting or recreation device to a standard bicycle form that is accessible to nearly all bike consumers. Navigant Research expects e-bikes to regularly replace bicycle purchases in Western Europe.

The North American e-bike market was relatively flat in 2015, largely due to low retail gasoline prices. In addition, several lower-priced models were discontinued as brands in the market transition toward higher-quality products. Nevertheless, the United States still has strong potential due to its enormous bicycle market (roughly 16 million sales per year).

1.3 Market Forecasts

Overall, the global e-bike market is projected to grow at a 0.4% compound annual growth rate (CAGR) over the forecast period (2016-2025). This slow-growing CAGR is expected to be largely due to China’s anticipated decline in annual unit sales (-0.8% CAGR).

Chart 1.1 Annual E-Bike Sales, China and the Rest of the World: 2016-2025



(Source: Navigant Research)

Excluding China, the global e-bike market is forecast to achieve strong growth—rising from 3.3 million annual unit sales in 2016 to nearly 6.8 million units by 2025 at an 8.2% CAGR. The bulk of this growth is expected to occur in Western Europe and other markets in Asia Pacific such as Japan and Vietnam.

Due to the expected contraction of China’s e-bike market, the global e-bike market share of the total bicycle market is expected to stay relatively unchanged through the forecast period (22.0%). However, in all markets outside of China, e-bike market share is expected to significantly increase through 2025.

Section 8

SCOPE OF STUDY

Navigant Research has prepared this report to provide participants at all levels of the e-bike industry, including OEMs, suppliers, trade associations, and battery manufacturers, with a study of the global market for e-bikes. The major objective is to determine the state of the industry and likely future growth of e-bike demand. In addition, the report provides a review of major demand drivers, technology developments, and key industry players within the competitive landscape.

The report's purpose is not to present an exhaustive technical assessment of e-bikes and technologies. Rather, it aims to provide a strategic examination from an overall tactical business perspective. Navigant Research strives to identify and examine new market segments to aid readers in the development of their business models. All major world regions are included and the forecast period extends from 2016 through 2025.

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.

Published 2Q 2016

©2016 Navigant Consulting, Inc.
1375 Walnut Street, Suite 100
Boulder, CO 80302 USA
Tel: +1.303.997.7609
<http://www.navigantresearch.com>

Navigant Consulting, Inc. (Navigant) has provided the information in this publication for informational purposes only. The information has been obtained from sources believed to be reliable; however, Navigant does not make any express or implied warranty or representation concerning such information. Any market forecasts or predictions contained in the publication reflect Navigant's current expectations based on market data and trend analysis. Market predictions and expectations are inherently uncertain and actual results may differ materially from those contained in the publication. Navigant and its subsidiaries and affiliates hereby disclaim liability for any loss or damage caused by errors or omissions in this publication.

Any reference to a specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not constitute or imply an endorsement, recommendation, or favoring by Navigant.

This publication is intended for the sole and exclusive use of the original purchaser. No part of this publication may be reproduced, stored in a retrieval system, distributed or transmitted in any form or by any means, electronic or otherwise, including use in any public or private offering, without the prior written permission of Navigant Consulting, Inc., Chicago, Illinois, USA.

Government data and other data obtained from public sources found in this report are not protected by copyright or intellectual property claims.

Note: Editing of this report was closed on June 15, 2016.

Pedego

Fountain Valley, California-based Pedego Electric Bicycles is a global designer and marketer of e-bikes. In addition to the United States, the company has distributors in the United Kingdom (for Europe), Canada, Australia, New Zealand, Russia, the Middle East, and South Africa. In countries with European standards, Pedego offers a reduced motor size of 250W. Navigant Research estimates that Pedego is the number one brand sold in the United States and the second largest unit seller in the United States behind Currie Technologies (which sells under multiple brands).

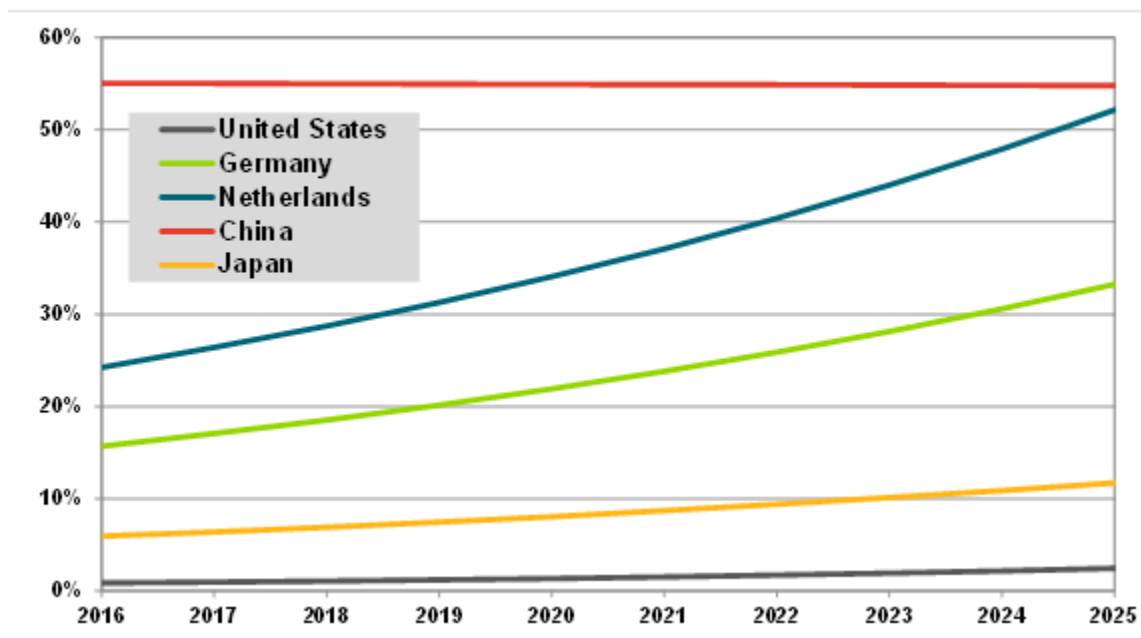
Since most of the company's models are priced at the higher end of the market (\$2,300-\$3,700), Pedego markets its e-bikes on quality, features, and style. The majority of models are designed in the cruiser style with many models having a 500W rear hub motor as standard. Pedego e-bicycle frames are manufactured in China to meet the company's designs. The company utilizes Samsung 18650 Li-ion batteries and assembles the bicycles in California.

In 2014, Pedego partnered with Ford Motors to design an e-bike for the Detroit-based automaker. The Ford Super Cruiser retails for \$3,695 and is powered by a 48V Li-ion battery and a 500W motor. In 2015, the company made a push into the e-mountain bike and e-cargo bike segments through the release of the Ridge Rider E-mountain Bike and the Stretch E-Cargo Bike.

Pedego is a privately owned company with approximately 300 dealers across the United States. The company has been finding increasing success with stores that are exclusive Pedego dealers, with currently more than 75 branded stores. Pedego e-bikes are sold in more than 800 stores across 40 countries.

www.pedegoelectricbikes.com

E-Bike Market Share of Total Bicycle Market by Country, Select Markets: 2016-2025



Source: Navigant Research