

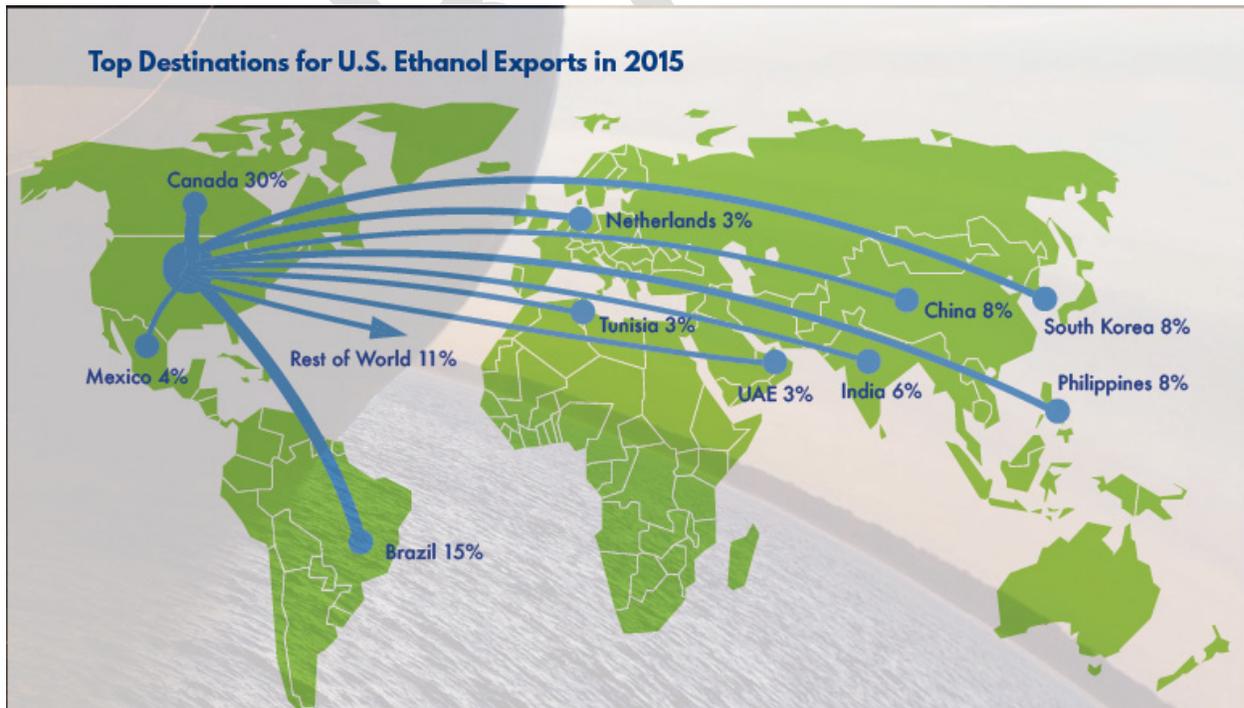
Smart Transportation Exports – Top Market Opportunities
White Paper Report for U.S. Dept. of Commerce Secretary Penny Pritzker
DRAFT as of February 2, 2016

This White Paper is presented by the REEEAC Smart Transportation (ST) Subcommittee to Secretary Penny Pritzker to demonstrate the top market opportunities in the Smart Transportation sector. There are several key growth areas in this sector, which are described in more detail below. Also, several trade shows and other key export marketing opportunities are highlighted. This is not an inclusive list, but the ST Subcommittee deemed it important to include as it directly showcases the DOC efforts both domestically and abroad. This White Paper will also be used to develop a training curriculum for DOC staff and others to assist in facilitating the promotion of Smart Transportation exports.

Ethanol Export Overview

In 2014, the U.S. produced more than 54 billion liters of ethanol (14.3 billion U.S. gallons). U.S. domestic demand has resulted in a current average blend rate of 10 percent (E10). In 2014, U.S. ethanol was exported to more than 60 countries around the world for both fuel and other industrial uses. In 2014, the U.S. exported 3.1 billion liters (825 million U.S. gallons) of fuel ethanol and 11.3 million metric tons of DDGS. Total year-to-date U.S. ethanol exports stood at 753.9 mg at the end of November, which implies annualized exports of 822 mg—similar to 2014 volumes.

The two largest export markets are to Canada and Brazil. The top countries for growing ethanol exports include China, India, Mexico, Peru, and Philippines. Other developing markets are Japan, South Korea, United Arab Emirates, and Oman.



Near-Term Upcoming Ethanol Export Trade Events

The U.S. Commercial Service, in conjunction with the USDA in India, is recruiting potential ethanol purchasers from the top 5 countries globally (as identified in the 2015 to attend the NEC International Buyers Program, being held in conjunction with the National Ethanol Conference in New Orleans, LA, February 15-17, 2016.

Also, as part of the APEC meeting of its Expert Group on New and Renewable Energy Technologies Forum, a two-day workshop on Ethanol Trade Development will held in Taichung City, Chinese Taipei funded in part through an APEC grant received by USDA's Foreign Agricultural Service. The tentative agenda will include technical presentations concerning the environmental and health benefits of increased ethanol blending in transportation fuels and the development of a domestic ethanol industry. Additional presentations will discuss renewable fuels policies, address challenges of introducing ethanol blends into the marketplace, including engine performance, impact on food supply, distribution infrastructure and the value of ethanol as an octane enhancer, and the role of trade in maximizing APEC's member countries ability to benefit from reducing their fossil fuel consumption by substituting ethanol for a portion of their motor gasoline requirements. The program will also include presentations of case studies that will provide an overview of each country's domestic ethanol industry. It is expected that 21 countries will participate in the meeting.

Recent Ethanol Technology Exports

Lanzatech

China - In November 2012, China Steel Corporation (CSC) and LCY Chemical Corporation formed a joint venture, White Biotech (WBT), as part of a Green Energy Alliance with LanzaTech. The resulting demonstration plant met or exceeded all ethanol production milestones and the CSC Board have formally approved the capital to move to commercial scale. A 50,000 MT (17M Gallons) per annum facility is planned for construction in Q4 2015, with the intention to scale up to a 100,000 MT (34M Gallon) per annum commercial unit thereafter. Initial product focus will be industrial ethanol and gasoline additives, with plans for increased product diversity utilizing LanzaTech's unique microbial capability.

Belgium - ArcelorMittal, the world's leading steel and mining company, LanzaTech, the carbon recycling company, and Primetals Technologies, a leading technology and service provider to the iron and steel industry announced in June 2015 they have entered into a letter of intent to construct Europe's first-ever commercial scale production facility to create bioethanol from waste gases produced during the steelmaking process. Construction of the €87 million flagship pilot project, which will be located at ArcelorMittal's steel plant in Ghent, Belgium, is anticipated to commence later this year, with bioethanol production expected to start mid-2017. Construction will be in two phases, with phase one providing an initial capacity of 16,000 tons of ethanol per annum by mid-2017 and phase two, which will be completed in 2018, bringing the total capacity to 47,000 tons of ethanol per annum.

Dupont

China - DuPont and Jilin Province New Tianlong Industry Co., Ltd., (NTL) announced a licensing agreement to begin the development of China's largest cellulosic ethanol manufacturing plant, located in Siping City, Jilin Province, China. The agreement allows NTL to license DuPont's cellulosic ethanol technology and use DuPont™ Accellerase® enzymes, to produce renewable biofuel from the leftover biomass on Jilin Province's highly productive corn farms. NTL is working to secure the necessary government approvals and support to implement this agreement.

Renewable Jet Fuel and Great Green Fleet

Secretary of the Navy Ray Mabus and Secretary of Agriculture Tom Vilsack kicked off the Great Green Fleet with the deployment of the USS John C. Stennis Carrier Strike Group (JCS CSG) during a ceremony at Naval Air Station North Island.

The Great Green Fleet is a Department of the Navy initiative highlighting how the Navy and Marine Corps are using energy efficiency and alternative energy to increase combat capability and operational flexibility. At the close of the ceremony, the Arleigh Burke-class guided missile destroyer USS Stockdale (DDG 106) left the pier to begin its deployment, becoming the first U.S. Navy ship running on an alternative fuel blend as part of its regular operations.

JCS CSG, the centerpiece of the Great Green Fleet, deployed using energy conservation measures (ECMs), including stern flaps, LED lights, and energy efficient operational procedures, and alternative fuel in the course of its normal operations. Other ships, aircraft, amphibious and expeditionary forces, and shore installations using ECMs and/or alternative fuels in the course of performing planned mission functions will be part of the Great Green Fleet throughout 2016.

Stockdale is the first surface combatant to receive alternative fuel as part of its regular operational supply. Following the ceremony, Secretary Mabus and Secretary Vilsack flew out to the destroyer USS William P. Lawrence (DDG 110) to witness it replenishing its tanks with alternative fuel from fleet replenishment oiler USNS Guadalupe (T-AO 200). The remainder of the CSG's surface ships will receive fuel from fast combat support ship USNS Rainier (T-AOE 7), which will take on over three million gallons of the alternative fuel blend in Washington state before joining the CSG on deployment.

The advanced fuel blend was produced by California-based AltAir Fuels from a feedstock of beef tallow - waste beef fat - provided by Midwest farmers and ranchers, and traditional petroleum provided by Tesoro. Pursuant to Navy requirements, the alternative fuel is drop-in, meaning it requires no changes to ship engines, transport or delivery equipment, or operational procedures. The Defense Logistics Agency awarded a contract to AltAir Fuels for 77.6 million gallons of the alternative fuel blend, at a cost to DLA of \$2.05 per gallon, making it cost competitive with traditional fuel.

The launch of the Great Green Fleet is significant to renewable fuel export markets, as the Navy as well as other military branches are working globally to source sustainable fuels for ships, airplanes and ground vehicles.

US Electric Vehicle Export Potential

In 2015, global production of electric vehicles (EVs) was 3.23 MM units, or 3.7% of total worldwide vehicle production of 88.44 MM units. According to PwC Autofacts, by 2022 these figures are expected to grow to 8.09 MM and 110.69 MM units respectively, resulting in a projected EV market share of 7.3%.

The term electric vehicles refers to a number of different technologies. The largest segment is the traditional full hybrid (70.5% 2015 market share), such as the original Toyota Prius, which combines gas and electric motors, and charges its battery as it drives. The next largest segment is the rapidly growing plug in-hybrid (11.1% 2015 market share), such as the new models that Prius and many others now offer, which after charging, has a pure electric range good for local trips and commuting, and uses a gasoline engine for longer trips.

The next segment is battery powered pure electric car (10.2 % 2015 market share), such as the Nissan Leaf or Tesla line, which plugs in to recharge, and is the segment most subject to “range anxiety,” and would benefit most from further development of lithium ion batteries. The next segment is the mild hybrid (8.1% 2015 market share), which doesn’t plug in or run in full electric mode, but does use an electric drive system to increase fuel economy. Finally, there is the hydrogen fuel cell driven electric vehicle (0.1% 2015 market share), which would require a major buildout of refueling infrastructure and is not currently projected (at least by PwC) to command significant market share in the near future.

Among US makers, current production includes the Chevrolet Volt, Bolt and Spark; Buick e-assist models of the Regal and LaCrosse; Cadillac ELR; Ford Fusion, Focus and C-Max; Lincoln MKZ; and Tesla models S and X. These are all assembled in the US, except for the Chevy Spark, which is made in Korea. The US content of these cars ranges from approximately 35% for the Fusion and Spark, to 75% to the Tesla Model S.

Foreign EVs assembled in the US include the Nissan Leaf and Toyota Avalon and Camry hybrids, which all have approximately 40% US content. Interestingly, the German built Mercedes Benz B Class E Cell has approximately 30% US content, due to its drivetrain provided by Tesla, in which Daimler Benz has an equity investment. (US content figures from the Kogod Made in America Auto Index, published by American University’s Kogod School of Business.)

In 2015, US manufacturers – Ford (66K), General Motors (23K) and Tesla (50K) – produced approximately 139,000 units, or 4.3% of the global EV market. The US manufacturers don’t release sales projections, but Ford and GM have primarily focused on the US domestic EV market thus far, with negligible exports. Only Tesla, in its 10Q report, has stated that expects almost half its long-term vehicle revenues from sales outside North America.

The world's top 10 manufacturers of lithium ion batteries for EV's, as of 2015, from the EvObsession.com website are: Panasonic, AESC, BYD, Mitsubishi/GS Yuasa, LG Chem, Samsung, Wanxiang, Beijing Pride Power, Tianneng and SB LiMotive. These companies are all Japanese, Chinese, or Korean, although four of them have US manufacturing operations, most prominently Panasonic's partnership with Tesla, and Wanxiang's acquisition of A123 out of bankruptcy.

The world's primary EV markets are the US, Western Europe, Japan and China. Realistically, with the exception of Tesla, US EVs and lithium ion batteries are both going to have to reach critical mass in the domestic market before they can reasonably expect success in the export markets, but with the growth expected in these sectors, they should receive continuing federal focus and support.

DRAFT