



Ball Aerospace: Boulder Energy Reporting ID EB160 and EB233

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On April 25, 2019 Ball Corporation announced the execution of two virtual power purchase agreements (VPPAs) – one wind and one solar – to address 100% of Ball's North American corporate, packaging and aerospace operations with new renewable energy by the end of 2021.

These agreements are a key part of Ball's overall sustainability strategy and support its efforts to leverage its sustainability credentials for profitable growth. Consumers, retailers and customers are increasingly focused on sustainability, and global concern about climate change and plastic pollution continues to grow. These VPPAs position Ball as one of the largest corporate buyers of renewable energy over the past year in the U.S. The two new agreements total 388 megawatts, which is estimated to produce 1.2 million MWh of renewable energy or the equivalent volume of electricity used by 100,000 U.S. homes each year.

Renewable energy is an important lever in making the company and its products more sustainable, as it allows Ball to reduce the environmental footprint of its own operations. Through the VPPA, which is a long-term contract between Ball and the renewable energy developers, Ball has greater flexibility and can address the energy usage across all of its North American operations without the need to build a solar or wind farm near every facility. With this type of arrangement, Ball can claim the environmental benefits of the wind and solar developments in Oklahoma and Texas with no disruption to its operations.

Sustainability is embedded in Ball's manufacturing operations and is a pillar of operational excellence. We recognize the impact our operations have on the environment and the local communities where we operate and are committed to continuous efficiency improvements. We introduce innovative processes and technologies that improve our safety track record, reduce energy and water consumption, cut greenhouse gas emissions, and divert more waste to beneficial use.

Ball Aerospace is known for its contributions in support of space and Earth science, exploration, national security and intelligence programs since 1956. We produce spacecraft, instruments and sensors, radio frequency and microwave technologies, laser remote sensing systems, data exploitation solutions, and a variety of advanced aerospace technologies and products that enable exciting missions.

Ball Aerospace systems measure key elements of the physical environment and support environmental monitoring and operational weather forecasting programs, and provide environmental intelligence on weather, the Earth's climate system, precipitation, drought, air pollution, vegetation and biodiversity measurements. The data captured through Ball-built instruments and satellites enables an enhanced understanding of the Earth's ecosystem and the stratospheric ozone layer, severe storm tracking, and search and rescue operations, and better enabling effective management of natural resources, including helping experts to make routine drought assessments and fire prevention plans.



Ball Aerospace pioneered the development of the commercial remote sensing market, producing imaging systems and spacecraft to help spawn a new market-driven demand for imagery. For example, Ball built the trio of WorldView satellites for DigitalGlobe, offering the best high-resolution imagery data gathering capability. This imagery is used for civil government mapping, land-use planning, disaster relief, exploration, defense and intelligence, visualization and simulation environments, and navigation technology such as Google Maps.

Many of the innovative space systems that Ball Aerospace builds support actionable environmental intelligence, and allow scientists and other stakeholders to better understand and address key sustainability challenges, such as the circular economy, climate change, water stewardship and responsible sourcing.

- The company's Suomi National Polar-orbiting Partnership (Suomi NPP) satellite, served as the National Oceanic and Atmospheric Administration's primary polar-orbiting operational weather satellite from 2012 to 2018, and continues to contribute vital information for national environmental forecasts, severe weather warnings, search and rescue operations, military contingency planning and environmental monitoring.
- Launched in late 2017, the NOAA-20 satellite (formerly Joint Polar Satellite System 1), is NOAA's primary and most-advanced polar-orbiting weather and environmental satellite system, taking critical measurements of the atmosphere, ocean and land surface across the globe, and providing essential data for civil and military weather forecasting, storm tracking, and continuity of NASA's long-term environmental data record.
- The company's Ozone Mapping and Profiler Suite is one of five instruments flying aboard the Suomi NPP and NOAA-20 satellites, returning detailed information about the health of the Earth's ozone layer—the shield that protects us from harmful levels of the sun's ultraviolet radiation. Research has shown a direct link from decreased stratospheric ozone to increased skin cancer cases in the United States.
- The Global Precipitation Measurement-Microwave Imager (GMI) supports the Global Precipitation Measurement mission, a joint effort between NASA and the Japan Aerospace Exploration Agency to improve the understanding of tropical weather dynamics to improve tropical storm, weather and hydrological predictions by providing highly accurate precipitation measurements from space. NASA has designated GMI the on-orbit calibration standard for all microwave radiometers flying in the GPM constellation.
- The Ball Aerospace spectrometer for the Tropospheric Emissions: Monitoring of Pollution mission will, for the first time, make highly accurate hourly observations of pollution with high resolution over North America. These measurements will



contribute to better understanding regional air quality and improved air quality forecasts.

- The Ball Aerospace Geostationary Environment Monitoring Spectrometer, built for South Korea, is designed to monitor pollution for the Korean peninsula and Asia-Pacific region. Hourly measurements of ozone and aerosols will improve early warnings for potentially dangerous pollution and hazardous air quality events.
- Ball Aerospace designed and built the Operational Land Imager for Landsat-8 (launched in 2013) and an identical instrument for the upcoming Landsat-9 mission, both of which are managed by NASA and operated by the U.S. Geological Survey. Data from the Landsat series of satellites enable the nation to manage its natural resources effectively, including helping experts to make routine drought assessments and fire prevention plans; monitor land changes; plan land uses; and better understand the Earth's ecosystem.
- The company designed and developed a laser instrument to make vertically resolved wind observations throughout the atmosphere. The World Meteorological Organization has identified this measurement as the most significant unmet observational need in the global observing system. This Ball instrument was recently demonstrated from a NASA aircraft, and the results indicate that this technology has matured to the point where it is ready to be taken to space. This Ball laser technology has roots in the Ball designed and built CALIPSO instrument, which NASA has been operating on-orbit for 13 years and has demonstrated Ball's ability to successfully operate a space-based lidar system.
- The high-spatial-resolution, multispectral satellite imagery from the Ball-built WorldView satellites is used for civil government mapping, land-use planning, disaster relief, exploration, defense and intelligence, visualization and simulation environments, and navigation technology such as Google Maps.
- A team led by Ball Aerospace team designed, built, and will launch in 2019, NASA's Green Propellant Infusion Mission (GPIM) to demonstrate and test the capabilities of a high-performance, non-toxic, "green" fuel on orbit. The new propellant is less harmful to the environment, increases fuel efficiency, and diminishes operational hazards for aerospace workers. The GPIM propellant also helps reduce emissions and resource use.
- Ball's airborne Methane Monitor technology is helping customers quickly, easily and affordably respond to potentially hazardous gas leaks. Flying on a single-engine, fixed-wing aircraft and using an active light detection and ranging system to observe gas leaks from the air, Methane Monitor is capable of surveying more than 100 square miles of oil and gas production regions, or 375 miles of transmission pipelines, per day.



Climate change is a top concern around the world and understanding weather and environmental impacts is critical. Ball Aerospace helps monitor key atmospheric constituents such as ash, smoke and aerosols with long-term effects to life on Earth, including the stratospheric ozone layer, which acts as a shield that protects us from the sun's harmful radiation.

Ball Aerospace supports the U.S. government's obligation to monitor stratospheric ozone depletion under the 1987 Montreal Protocol—an international agreement to ensure there are no gaps in the protective layer of ozone that surrounds the Earth—with its Ozone Mapping and Profiler Suite (OMPS). This instrument measures how ozone concentration varies with altitude, while helping forecasters predict extreme wind events, track the migration of smoke, pollution, volcanic ash and meteor debris, and helps scientists better understand our dynamic planet.

Ball Aerospace is a subsidiary of Ball Corporation and is an integral part of the company's larger sustainability program. Ball Corporation focuses its sustainability efforts on four priorities: Product Stewardship, Operational Excellence, Talent Management, and Community Ambassadors. Sustainability clearly is not a one-person job. Ball's employees, together with its customers, suppliers, and through several multi-stakeholder partnerships, address key sustainability challenges. Global and business-specific data are available at www.ball.com/data-center.

Ball was listed on the 2018 Dow Jones Sustainability Indices (DJSI) World and North America for the sixth year in a row, further validating its progress in making the can the most sustainable package. The DJSI index family tracks the financial performance of the leading sustainability-driven companies worldwide based on an analysis of financially material economic, environmental, and social factors. Ball achieved industry leading scores once again on criteria such as product stewardship, occupational health and safety, codes of business conduct and environmental reporting.

Ball is also a member of the FTSE4Good Index Series on the London Stock Exchange since 2009 and is a constituent of the 2018 MSCI ESG Leaders Indexes. Vigeo Eiris, a leading European expert in assessing responsible performance, selected Ball as a member of the Euronext Vigeo World 120 and US 50 indices (last confirmation November 2018). Ball has been selected for inclusion in the Calvert Responsible Index Series. This index series represents a portfolio of large capitalization stocks listed on U.S. stock exchanges that meet Calvert's Environmental, Social, and Governance (ESG) criteria for index inclusion. Also, Ball Corporation qualified for inclusion in the 2019 Sustainability Yearbook, published by RobecoSAM, receiving the Silver Class distinction for its excellent sustainability performance. 2019 marks the ninth year in a row that RobecoSAM included Ball in its book. Additional recognitions for its sustainability performance can be found at www.ball.com/sustainability.

Ball is committed to helping make the Sustainable Development Goals (SDGs), global goals to end poverty, protect the planet, and ensure prosperity for all by 2030, a reality. All of its four sustainability priorities and associated goals are aligned with and contribute



to 10 of the 17 SDGs. Ball's main contribution will derive from its operations and its value chain. Ball will focus on shared value creation—through jobs, investments and economic growth, environmental protection, research and development, and the high sustainability standards to which the company holds itself and its suppliers accountable.

When working toward the global goals, Ball's employees and their community engagement are valuable resources. This is why Ball joined IMPACT 2030, the only business-led effort designed to harness the power of corporate volunteers to address the SDGs. IMPACT 2030 believes that a commitment to corporate volunteering—when used in concert with the UN, peer companies, government, academia and civil society—is a powerful tool to accelerate the use of sustainable development principles and inspire the private sector to take positive action.

Building on the positive initial experiences with small-scale renewable energy, Ball joined the Rocky Mountain Institute's Business Renewables Center (BRC) in 2017. The BRC platform streamlines and accelerates corporate purchasing of off-site, large-scale wind and solar energy, making it easier for us to enter the renewable energy market by learning from the first movers. As a next step on our renewables journey, we established a cross-functional renewables team at Ball and engaged a third-party renewable energy consultant in 2017 to explore opportunities to cover a significant portion of our North American electricity load with renewables. We are focusing on North America first because 52 percent of our 2017 global electricity load and 62 percent of our Scope 2 GHG emissions come from North America, and due to the favorable energy market conditions in that region. We concluded the project selection process in early 2019 and then are currently exploring further opportunities in Europe and other regions where it makes economic and environmental sense.

To drive measurable progress within operations and hold the company accountable for improving its processes, each Ball plant commits to two-year sustainability goals. Progress is reported yearly for Ball Aerospace, aggregated as one plant within Ball, and evaluated by senior management within Ball's Sustainability Steering Committee. For Ball Aerospace, a standardized measurement system that enables year-to-year comparisons on metrics is used. The high visibility of the company's performance with respect to these metrics helps drive accountability, engagement, and progress toward these goals.

For 15 years, Ball has utilized a Carbon Intensity Index (CII) that is calculated based on the total GHG emissions (Scope 1 and 2) of each business in which we operate, normalized by a denominator specific to each business. The normalization factor is a weighted approach based on the differing intensities of production/sales in the base year. It accounts for overall production changes over the goal period, and for changes in production mix between the various business segments. In the past, we committed to 10- and 5-year CII reduction targets (2002-2012 and 2010-2015), which were achieved on or ahead of time (2010, 2015). At the end of 2017, Ball had achieved a 23 percent reduction in our CII from a 2010 baseline, averaging a 3 percent reduction per year. To help tackle climate change, Ball set a bold new science-based greenhouse gas emission reduction



target, in line with the level of decarbonization required to keep the average global temperature increase below 2 degrees Celsius compared to pre-industrial temperatures.

Utilizing renewable energy with the new North America VPPAs will enable Ball to make considerable progress on its bold greenhouse gas (GHG) emission reduction target. By 2030, we will reduce our absolute Scope 1 and 2 GHG emissions by 27 percent against a 2017 baseline. Per million dollars of value added, this equates to a 56 percent reduction of our carbon intensity over the same period. In addition, Ball strives to reduce GHG emissions across the value chain—from mining, refining, smelting, casting and rolling, to Ball’s manufacturing, logistics, and end-of-life recycling—per can produced by 25 percent over the same period. At this time, we are in the process of submitting our target for approval by the Science Based Targets initiative. We follow a three-pronged approach to achieve our targets; 1) Increase efficiency: save energy and materials, 2) Grow renewables: purchase renewable energy, and 3) Cut embedded carbon: work with partners to reduce upstream impacts.

To support Ball Corporation’s global sustainability efforts, Ball Aerospace sets sustainability goals across its building portfolio in lieu of setting them for individual buildings or municipalities. This allows Ball Aerospace to take a broad approach to sustainability and energy reduction. There are not specific goals per building or per industrial complex as defined by the City of Boulder as this sub-optimizes the allocation of resources available to support energy reduction efforts as a whole and would result in less benefit than looking at the whole portfolio. Sustainability goals are normalized to provide standardized year-to-year comparisons. Ball Aerospace normalizes based on dollars of sales while high production business units’ normalization is based on number of units produced.

Ball Aerospace’s 2018 energy goals, established in late 2017 for its two-year sustainability commitment to Ball Corporation, was a decrease of 6.6% in electrical consumption over the 2017 baseline and a decrease of 6.5% for natural gas consumption over the 2017 baseline. As previously stated, energy consumption for Ball Aerospace is normalized over sales. Ball Aerospace’s overall electrical energy consumption, once normalized, showed a decrease of 13.4% from its 2017 level. For natural gas, the company had an 8.5% reduction from 2017. For ID EB160, Ball Aerospace saw a decrease in electrical consumption of 1.3%. For the same industrial complex, Ball Aerospace’s cumulative utility usage savings has generally increased year-to-year since 2008. For ID EB233, the company saw a 6.6% decrease in natural gas consumption and has seen a general leveling off in electrical consumption since 2015.

For the reporting year of 2018, Ball Aerospace implemented several energy sustainability projects within its Colorado portfolio with the potential to save over 349,000 kWh annually:

- Installed variable frequency drives on pumps in a manufacturing building located in Westminster, CO (outside of Boulder’s jurisdiction).
- Replaced existing interior lighting in several spaces in ID EB160 with LED fixtures.



- Replaced existing interior lighting in two Boulder, CO buildings with LED fixtures (not located in either Large Industrial Complexes)