

The same technology used to increase operational efficiencies can also save energy and reduce greenhouse gas emissions.

By Leslie Downey

Mar. 19, 2012—A growing number of people now recognize radio frequency identification's potential to help industry and commerce increase profitability by enabling operational efficiencies. Less commonly understood is that the technology can make a significant contribution to environmental sustainability. *RFID Journal's* Green Award, a new category added last year to the annual [RFID Journal Awards](#) competition, provides companies with an opportunity to demonstrate this in 2012 and beyond. Radio frequency identification can play a meaningful role in slowing global warming, the gravest threat to the environment. The same RFID-enabled, operational efficiencies that increase profits can also save energy and reduce greenhouse gas (GHG) emissions.

The Problem

The [Intergovernmental Panel on Climate Change](#) (IPCC), an intergovernmental body of 2,500 scientists established in 1988 by the [United Nations](#), the [World Meteorological Organization](#) (WMO) and the [United Nations Environment Programme](#) (UNEP), has concluded that global atmospheric concentrations of the three main greenhouse gases—carbon dioxide (CO₂), methane and nitrous oxide—have increased markedly since 1750 as a result of human activity. These gases are the primary drivers of global warming, they say, and now exceed pre-industrial levels over the past 650,000 years. CO₂ comes mostly from fossil fuels used in power plants, transportation, industrial processes, and the heating of residential and commercial buildings.



Government policies aimed at stemming global warming have disappeared from the U.S. legislative agenda at a most unfortunate time. An estimated 98 percent of the world's climate scientists agree that global warming, if unmitigated, will pose severe problems for much of Earth's population by the mid-21st century, and a threat to humanity itself as early as century's end—and it is happening faster than predicted even five years ago.

In November 2011, Fatih Birol, the chief economist of the [International Energy Agency](#) (IEA), reported that current global energy-consumption levels put the planet on a trajectory to warm by 6 degrees Celsius (10.8 degrees Fahrenheit) above pre-industrial levels by 2100, an outcome he deemed "a catastrophe for all of us."

Although the carbon intensity of developed country economies (GHG per unit of gross domestic product [GDP]) has been declining over the past 50 years, GDP growth in many of these countries has caused year-to-year growth in greenhouse gas emissions overall. Furthermore, demand for energy is accelerating. In the United States, it is expected to increase by as much as 40 percent over the next two

decades, equivalent to 357 large coal plants. Now, consider the rest of the world. A projected increase in population, from the current 7 billion to 9.5 billion in 2050, along with a rise in the standard of living in many developing countries, will likely double the world's energy consumption by 2050.

Atmosphere as Open Sewer for Carbon

International climate negotiators have pledged to limit the global temperature rise to 2 degrees Celsius (3.6 degrees Fahrenheit) above pre-industrial levels. In its most recent report, issued in 2007, the IPCC reported that the world would need to lower emissions by 50 percent to 80 percent by 2050, in order to stabilize temperatures within that range. Now, many leading climate scientists—including James Hansen, the director of NASA's [Goddard Institute for Space Studies](#)—say emissions must be cut faster in order to achieve that goal: The quantity of CO₂ in the atmosphere, they claim, must be reduced from the current level of 390 parts per million (ppm) down to 350 ppm.

Meanwhile, the CO₂ level is climbing rapidly. If unabated, the amount of carbon dioxide is projected to exceed 450 ppm by 2020. Climatologists have pointed out that this level prevailed when the Earth was ice-free. Hansen asserts that 450 ppm in 2020 would result in a temperature rise of 6 degrees Celsius (10.8 degrees Fahrenheit) by the end of this century, resulting in "the end of civilization as we've come to know it."

Some of the predicted consequences are:

- A staggeringly high temperature rise, especially over land—some 10 degrees Fahrenheit (5.5 degrees Celsius) over much of the United States
- A rise in sea level of 3 to 7 feet (0.9 to 2.1 meters), rising some 6 to 12 inches (15.2 to 30.5 centimeters) or more each decade thereafter
- Permanent dust bowls over the U.S. Southwest, as well as many other heavily populated regions around the globe
- Massive species loss on land and in the sea—some 50 percent of all life worldwide, with huge dead zones in the oceans, due to acidification from absorption of CO₂
- Massive wildfires
- More severe hurricanes

However, the United Kingdom's national weather service, the [Met Office](#), says that based on present evidence, global warming and the resulting climate changes could be slowed if emissions of methane and carbon dioxide were reduced.

Such a prediction may be optimistic. In 2010, global carbon emissions were about 9.1 gigatons (9.1 billion metric tons). According to the IPCC's 2007 report, even a very strong mitigation effort during this century, keeping carbon emissions at an annual average of 11 gigatons of CO₂, will likely take us to 1,000 ppm. The scientific community has spent little time modeling the impacts of a tripling (to 830 ppm) or quadrupling (to 1,100 ppm) of carbon dioxide concentrations from preindustrial levels. Until recently, this was considered unthinkable.

RFID Has a Role to Play

The longer the world waits to address the global warming problem, the more expensive it will be to do so at a later date. The International Energy Agency estimates that delaying action until just the end of this decade would quadruple costs to the global economy.

Clearly, the time to act is now. Substituting non-carbon energy sources for fossil fuels in power generation and transportation is critical. However, even aggressive plans to do this will take time. Conserving fossil fuel by using it more efficiently can be accomplished quickly. RFID can play a significant role here, by helping to optimize the production, transportation, inventorying, reclamation and recycling of goods, as well as through more efficient buildings and people transport.

Here are some examples:

Supply Chain

Reducing out-of-stock situations within stores saves customers car trips. [Wal-mart](#) has estimated that inventory management through item-level RFID tagging within its stores has the potential to eliminate extra trips for 100,000 customers daily—customers who would otherwise seek products elsewhere. The retailer has calculated that this would result in the elimination of 80,209 metric tons of CO2 per year.

Reducing excess inventory saves production and transportation. In a 2008 article written by Mickey Brazeal, titled "[Green Revolution: RFID and the Rise of Convenient Sustainability](#)," Sandra Hughes, the global information governance and privacy executive at [Procter & Gamble \(P&G\)](#), stated that greater accuracy in supply chain tracking from RFID had enabled the company to begin reducing safety-stock levels. Hughes estimated that P&G had been keeping more than 65 days of inventory out in the supply chain, en route to retailers, so that they would never run out, at an annual cost of \$3 billion. One can infer that reducing this excess stock would save an enormous amount of energy—as well as GHG emissions—by reducing the need for extraction, production and transportation associated with the stock.

Transportation

Improved Cargo Management

The accurate location of cargo containers, truck trailers and drivers in seaport cross-docking applications saves fuel, pollution and over-production. [NYK Logistics](#) has dramatically improved service levels and productivity at several of its port facilities, through the use of an RFID-enabled, real-time location system (RTLS). The company has decreased truck idling times from hours to minutes, and has removed two days of "dwell time" for inbound goods moving through the supply chain. Customers are able to reduce safety stock levels and the expediting of orders, thanks to superior, Web-based visibility of their in-transit goods.

Electronic Toll Collection

Electronic toll collection (ETC) systems reduce idling and emissions. Solutions such as [E-ZPass](#) and [I-Pass](#) employ radio frequency identification. They save millions of tons of CO₂ that would have otherwise been emitted by vehicles waiting to enter toll gates. The E-ZPass system reduced delays on the New Jersey Turnpike for all vehicles by 85 percent, saving an estimated 1.2 million gallons of fuel each year, while also eliminating approximately 0.35 ton of volatile organic compounds and 0.056 ton of nitrogen oxides per weekday. A 2001 ETC pilot project conducted by the [California Department of Transportation](#) (CalTrans) on just one bridge—the Carquinez Bridge, located in Vallejo, Calif.—showed savings of 55,525 gallons of fuel within one year, as well as 9.8 metric tons of CO₂, 1.06 metric tons of nitrogen oxide and 0.46 metric ton of hydrocarbons.

Automatic Vehicle Identification Parking

Employee parking garages equipped with automatic vehicle identification (AVI) systems save time, fuel and emissions. Instead of stopping to insert a magnetic stripe card into a reader, and then sometimes waiting in morning queues, AVI users, equipped with RFID-enabled cards inside their vehicles, can simply drive through the gates. [TransCore](#), an AVI system vendor, estimates that an AVI-enabled parking garage containing 500 cars saves about 275 employee hours annually, along with 5,480 pounds of CO₂.

Buildings

RFID-enabled building-management systems conserve fuel and electricity. Commercial, public and residential buildings within the United States contribute approximately 40 percent of the nation's greenhouse gas emissions. Intelligent systems using RFID and wireless sensors enable dynamic and granular control of a building's heating, ventilating and air conditioning (HVAC) systems, thereby saving energy and emissions. The [Global e-Sustainability Initiative](#) has estimated that in 2020, buildings will emit 11.7 gigatons of CO₂ worldwide, equivalent to 22.5 percent of total emissions. It has also estimated an information and communications technology-enabled abatement potential of 1.68 gigatons of CO₂, of which a reduction in HVAC consumption accounted for 8 percent.

What's more, in order to facilitate home energy management, companies are currently developing products that utilize ZigBee-compliant RFID technology to enable communication between such household devices as thermostats and lighting controllers, as well as smart meters, so that usage can be shifted to off-peak times.

Cities

"Intelligent cities" will save time and gigatons of CO₂. Cities abound with current and potential applications of radio frequency identification conserving energy. One example is traffic lights equipped with RFID and congestion sensors. Another is RFID-based parking-management systems allowing more precise tracking of parking availability on streets and in garages. Having this kind of granular data enables not only real-time decisions, but also better planning of new facilities and improvements.

New Standards Facilitate Quantification of RFID's Climate Benefits

Despite the lack of U.S. legislation assigning the true costs of fossil fuels to producers rather than to society at large, a growing number of U.S. companies are joining businesses in other countries in reporting greenhouse gas emissions. The [U.S. Environmental Protection Agency](#) (EPA) has issued the Mandatory Reporting of Greenhouse Gases Rule, requiring the reporting of GHG data from large sources and suppliers. In 2011, EPA launched a new reporting tool enabling some 7,000 companies within 28 sectors, including power plants, petroleum refineries, and landfills, to submit 2010 GHG pollution data electronically.

For several years, many companies have been voluntarily reporting GHG levels to not-for-profit organizations like the [Carbon Disclosure Project](#), the [Global Reporting Initiative](#) and the [Climate Registry](#).

For nearly a decade, the [Greenhouse Gas Protocol Initiative](#), a nonprofit formed jointly by the [World Resources Institute](#) and the [World Business Council for Sustainable Development](#), has been developing standards for the accounting and reporting of greenhouse gas emissions. In October 2011, the organization launched the Product Life Cycle and Scope 3 (Corporate Value Chain) Accounting and Reporting standards. In January 2012, more than 60 corporations throughout 17 nations began road-testing these standards in measuring emissions from products and supply chains. Progress in standards like these will make it easier to show how RFID can make a positive contribution.

Leslie Downey is the principal and founder of [RFID Revolution](#), which provides [RFID Essentials](#), an interactive e-learning program designed to help end-user organizations think more creatively about how they can take advantage of radio frequency identification, and plan successful deployments. The program enables professionals in IT, finance, operations, engineering and other disciplines to quickly learn the basics of RFID, how to use the technology to improve operations and how to find the return on investment.