



# 2015 Minerals Yearbook

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**LIME [ADVANCE RELEASE]**

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# LIME

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In 2015, lime production in the United States (including that in Puerto Rico) was 18.3 million metric tons (Mt) and had a value of \$2.29 billion (table 1). Based on unrounded data, these were decreases of about 1.3 Mt and \$101 million from those of 2014. Lime consumption decreased in most major market sectors (chemical and industrial, environmental, metallurgical, and refractories) (table 3). On average, prices for lime sold or used increased by \$2.90 per metric ton (table 5), continuing the trend which started in 1998.

Lime plants and facilities need to be located close to markets that have access to suitable transportation networks to allow for cost-effective production and distribution. The U.S. lime industry is dominated by a few large-scale producers with nationwide supply and distribution networks. Because there is a scarcity of high-quality limestone deposits for which required zoning and mining permits can be obtained, production capacity increases at existing locations are usually met by replacing older kilns and using existing air quality permits for new, more efficient, and higher capacity kilns that have reduced air emissions.

As in 2014, the U.S. lime industry consisted of 31 companies in 2015 (Corathers, 2015). Of these, 16 companies produced lime products for sale, 10 companies produced lime that was used entirely for internal company purposes, and 5 companies did both. Owing to its reactivity and short shelf life, lime is not stockpiled in large amounts and data on stocks are not collected. On an annual basis, lime “sold or used” is considered to be equivalent to both production and consumption. Lime, as quicklime, is a basic chemical produced in 29 States and Puerto Rico.

The term lime as used throughout this report refers primarily to six chemicals produced by the calcination of high-purity limestone (calcium carbonate,  $\text{CaCO}_3$ ) or dolomite [ $\text{CaMg}(\text{CO}_3)_2$ ], followed by hydration where necessary. There are two high-calcium forms of lime—high-calcium quicklime (calcium oxide,  $\text{CaO}$ ) and high-calcium hydrated lime [calcium hydroxide,  $\text{Ca}(\text{OH})_2$ ]. There are four calcium-magnesium (dolomitic) forms—dolomitic quicklime ( $\text{CaO}\cdot\text{MgO}$ ), dolomitic hydrate type N [ $\text{Ca}(\text{OH})_2\cdot\text{MgO}$ ], dolomitic hydrate type S [ $\text{Ca}(\text{OH})_2\cdot\text{Mg}(\text{OH})_2$ ], and refractory dead-burned dolomite ( $\text{CaO}\cdot\text{MgO}$ ). The terms “type N” and “type S” refer to “Normal hydrated lime” and “Special hydrated lime” that are differentiated primarily by the compounds’ plasticity (ability to retain water) and oxide content. There are also air-entrained versions of these hydrates designated as “type NA” and “type SA.”

At present, all commercially produced lime in the United States is manufactured from limestone or dolomite, but lime also can be produced from a variety of similar carbonate materials, such as aragonite, chalk, coral, marble, and seashells. Lime also is regenerated (produced as a byproduct) by carbide

plants, paper mills, sugar mills, and water-treatment plants. Regenerated lime, however, is not covered in this report.

In the United States, most lime (about 85%) is produced as quicklime (table 1). Hydrated lime is a dry calcium hydroxide powder made from reacting quicklime with a controlled amount of water in a hydrator. Slaked lime is another term often used for hydrated lime. Slaked lime also includes dispersions (suspensions) of calcium hydroxide particles in water, either in the form of milk-of-lime or lime putty. Milks-of-lime contain up to 40% by weight of solids and lime putties contain 55% to 70%. Slaked lime is widely used in aqueous systems as a low-cost alkali to neutralize or balance acidity (Oates, 1998, p. 1, 229).

## Production

Domestic production data for lime were derived by the U.S. Geological Survey (USGS) from a voluntary canvass of U.S. operations. The canvass was sent to primary producers of quicklime and hydrate but, to avoid double counting, it was not sent to independent hydrators that purchase quicklime for hydration. Quantity data were collected for 28 specific and general end uses, and value data were collected by type of lime. Of the 94 operations that were canvassed in 2015, data were received for 78 operations, including 5 that were idle during the entire year. Data received represented 98% of the total lime sold or used by producers listed in tables 1 through 5. Production data for the nonrespondents were estimated based on prior-year production data and other information.

In 2015, quicklime was produced at 77 lime plants, including 31 plants with colocated hydrating plants. Hydrated lime also was produced at 15 stand-alone hydrating facilities, including 3 plants where the kilns had been shut down but hydrate was manufactured from quicklime produced offsite. These numbers do not necessarily agree with the number of plants reported in table 1 because, for data collection purposes, some company operations have been combined at the respondent’s request. In a few States with no quicklime production, hydrating plants used quicklime sourced from other States. There were also stationary lime slurry plants in some States where hydrated lime was converted (slaked) to form lime slurry by the addition of water prior to sale (milk-of-lime). Mobile hot lime slurry production systems were also used to slake quicklime or to make hydrated lime slurry to the percentage of solids (milks-of-lime or lime putties) required for specific jobs.

Data on lime sold or used in the United States are reported by U.S. Census Bureau region (table 2). In 2015, Alabama was one of only two States that had production in excess of 2 Mt that can be revealed. There were four States with production of between 1 and 2 Mt, two of which can be revealed—Ohio and Texas, in descending order.

<sup>1</sup>Deceased.

In 2015, production, or the total amount of lime sold or used by domestic producers, including Puerto Rico, was 18.3 Mt (table 1), a 6% decrease compared with that of 2014. The total included the commercial sale or captive consumption by producers (described by the term “used”) of quicklime, hydrated lime, and dead-burned refractory dolomite. Data were incomplete on the production of hydrated lime because some producers do not report data on downstream hydrating plants.

Most U.S. lime production sold or used is in the form of high-calcium quicklime. In 2015, production of high-calcium quicklime decreased by 7% to 13.1 Mt and dolomitic quicklime decreased by 7% to 2.55 Mt (table 1). Compared to 2014, the production of high-calcium hydrate decreased slightly and dolomitic hydrate production remained the same. Commercial sales of quicklime and hydrate decreased by 6% to about 17 Mt, and lime produced for captive consumption decreased by 8% to 1.28 Mt.

At yearend, the top 10 lime-producing companies were, in descending order of U.S. lime production, Lhoist North America; Carmeuse Lime and Stone; Graymont Ltd.; Mississippi Lime Co.; Martin Marietta Magnesia Specialties LLC; United States Lime & Minerals, Inc.; Unimin Corp. (doing business as Southern Lime Co.); Cheney Lime & Cement Co.; Pete Lien & Sons, Inc.; and Greer Lime Co. These companies reported production from 45 lime plants and 10 stand-alone hydrating plants and accounted for nearly 97% of the combined commercial lime sales and nearly 90% of total lime production.

Graymont Ltd. continued installation of a vertical shaft parallel flow regenerative lime kiln at its Pleasant Gap, PA, plant. Construction of the new kiln was expected to increase the plant’s capacity by 25%, and production would begin in early 2016 (Graymont Ltd., 2012; 2016a, p. 15). In March, Graymont announced that it had received approval from the Michigan Department of Natural Resources for the company’s 2014 Rexton land transaction proposal in the Upper Peninsula. The transaction would involve the sale and exchange of lands within Luce and Mackinac Counties. The Rexton project includes expansion of limestone quarry operations and future lime production (Graymont Ltd., 2015c).

Carmeuse Lime and Stone continued to work on the installation of two new gas-fired vertical shaft kilns at its Clear Brook plant near Winchester, VA. The kilns would replace the plant’s existing rotary lime kiln. Each kiln would have a capacity to produce 400 metric tons per day, the combination of which would double the plant’s previous operating capacity (Carmeuse Lime and Stone, 2016).

## Consumption

In 2015, reported U.S. lime consumption decreased in most major market sectors (table 3). The percentage distribution of lime consumption by general end-use sectors was little changed from that of 2014, and was 34.4% for metallurgical uses, 31.2% for environmental uses, 23.1% for chemical and industrial uses, 10.2% for construction uses, and 1.0% for refractories. These end-use data were based on lime sold or used by domestic producers and do not include lime imports. Lime consumption tonnage for all metallurgical uses was generally significantly lower in 2015 than in 2014, led by a

combined 908,000-metric-ton (t), or 16%, decrease in use in basic oxygen furnaces (BOFs) and electric arc furnaces (EAFs) used in steelmaking.

Commercial sales (lime sold by producers) accounted for 93% of total U.S. lime consumption (table 1). Captive lime (lime that is used by companies for internal purposes) accounted for the remainder of consumption and was used in the production of steel in BOFs, magnesia production, precipitated calcium carbonate production, sugar refining, and refractories (dead-burned dolomite). Almost all end-use data on captive lime consumption were withheld to avoid disclosing company proprietary information. As a result, table 3 only lists the total quantity (commercial plus captive) by end use. Additional end uses with captive consumption are listed in footnote 5 of table 3.

In steel production, quicklime is used as a flux and slagging agent in BOFs and EAFs to remove impurities, such as phosphorus, silica, and sulfur, from the hot metal. The steel industry accounted for 27% of lime sold or used by domestic lime producers. According to the World Steel Association (2016), U.S. steel production in 2015 decreased by 10.5% to 78.9 Mt from that of 2014; lime sold for total steel and iron uses in 2015 was 17% less than that of 2014 (table 3).

In nonferrous metallurgy, lime is used in the beneficiation of copper and zinc ores to neutralize the acidic effects of pyrite and other sulfides and to maintain the proper pH in the flotation circuits. It is also used as a depressant to prevent pyrite from entering the copper or zinc concentrate. Lime is used to process alumina and magnesia, extract uranium from gold slimes, and recover nickel by precipitation.

Gold and silver are recovered using heap leaching and by conventional milling and subsequent leaching of the slurry. Heap leaching involves crushing the ore, mixing it with lime for pH control and sometimes agglomeration, and stacking the ore in heaps on specially prepared pads for treatment with cyanide solution. Lime is used to maintain the pH of the cyanide solution at a level between 10 and 11 to maximize the recovery of precious metals and to prevent the creation of hydrogen cyanide gas.

Lime consumption data for nonferrous metallurgical uses [alumina and bauxite processing, flotation processing of sulfide ores (principally copper and gold ores), and unspecified nonferrous uses] are combined to avoid disclosing company proprietary data and are reported in table 3 under “Metallurgical: Nonferrous metallurgy.” In 2015, lime consumption in nonferrous metallurgy decreased by 5% to 1.33 Mt (table 3) from the peak of 1.39 Mt in 2014. Although specific data are not collected on lime consumption for copper or gold recovery processes, they make up a large part of the nonferrous metallurgy market. Recovery of contained copper from flotation concentrates decreased by 5% compared with that of 2014 (Brininstool, 2016, table 2). Domestic gold production, however, increased slightly compared with that of 2014 (George, 2016).

Lime is used in numerous processes to treat discharges to the environment in active or abandoned mines. These processes include the treatment of acid-mine drainage from operating and abandoned mines, specialized treatment processes such as catalyzed cementation of arsenic and other heavy metals, and treatment of precious metals mine tailings to recover cyanides.

Lime is used, generally in conjunction with soda ash ( $\text{Na}_2\text{CO}_3$ ), for softening municipal and plant process water. This precipitation process removes soluble calcium and magnesium cations (and to a lesser extent, ferrous iron, manganese, strontium, and zinc cations) that contribute to the hardness of water. This process also reduces carbonate alkalinity and total dissolved solids. Lime consumption for drinking water treatment increased by 5% in 2015 compared with that of 2014 (table 3).

In sewage treatment, the traditional role of lime is to control pH in the sludge digester, where it removes dissolved and suspended solids that contain phosphates and nitrogen compounds. Lime also aids in clarifying and in destroying harmful bacteria in the wastewater. The leading use in sewage treatment is to stabilize the resulting sewage sludge for beneficial use or disposal. Sewage sludge stabilization, also called biosolids stabilization, reduces odors, pathogens, and putrescibility of the solids. Lime stabilization involves mixing quicklime with the sludge to raise the temperature and pH of the sludge to minimum levels for a specified period of time, depending on the biosolids classification. The National Lime Association (undated) has a concise description of lime's use in biosolids stabilization. In 2015, lime consumption for all sludge treatment increased by 19% compared with that of 2014 (table 3). Most of the increase was in the treatment of industrial and hazardous wastes.

In flue gas treatment (FGT) systems serving coal-fired powerplants, incinerators (most are waste-to-energy powerplants), and industrial plants, lime is injected into the flue gas to remove gaseous pollutants, particularly sulfur dioxide ( $\text{SO}_2$ ) and hydrochloric acid (HCl). Many FGT systems at utility powerplants are now designed to produce byproduct synthetic gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) from the captured  $\text{SO}_2$ . This gypsum is suitable for use in manufacturing wallboard, as an additive in portland cement, and as a soil amendment in agriculture. Hydrated lime may be used in another FGT-related market—to control sulfur trioxide ( $\text{SO}_3$ ) emissions from selective catalytic reduction systems installed at powerplants to control emissions of nitrogen oxides ( $\text{NO}_x$ ). Utility powerplants were by far the leading consumers of lime for FGT and accounted for 88% of the total FGT lime market in 2015 (table 3). Incinerators, industrial boilers, and other FGT uses accounted for the remainder. In 2015, lime consumption decreased by 10% in the utility powerplant FGT market, but increased in the other FGT markets. Most of the increase, based on quantity, was in the industrial boilers and other FGT uses sector, where lime consumption increased by 49,000 t or nearly 30% compared with that of 2014. The amount of lime consumed in the incinerators sector increased by 41,000 t. The use of hydrated lime in FGT in 2015 increased by about 4% to 369,000 t (table 4). This increase was attributed to the industrial boilers and other FGT sector.

Slaked lime is used by the pulp and paper industry in the basic kraft pulping process for converting wood chips into wood pulp. Slaked lime is sometimes used to produce calcium hypochlorite bleach for bleaching the paper pulp. The paper industry also uses lime as a coagulant aid in the clarification of plant process water. In 2015, consumption for pulp and paper production was essentially unchanged from that in 2014 (table 3).

Lime is used in the manufacture of a wide range of chemicals. Lime is used to make precipitated calcium carbonate (PCC), a specialty filler used in premium-quality coated and uncoated papers, paints, and plastics. The most common PCC production process used in the United States is the carbonation process. Carbon dioxide ( $\text{CO}_2$ ) is bubbled through milk-of-lime to form a precipitate of calcium carbonate and water. The reaction conditions determine the size and shape of the resulting PCC crystals. Lime used for PCC production decreased slightly compared with that of 2014 (table 3).

The chemical industry also uses lime in the manufacture of alkalis. Other chemical uses include the production of calcium carbide, which is formed when quicklime is combined with coke; calcium carbide, in turn, is used to make acetylene and calcium cyanamide. Lime is also used to make calcium hypochlorite bleaches, citric acid, petrochemicals, and many other chemicals.

In sugar refining, milk-of-lime is used to raise the pH of the product stream, precipitating out colloidal impurities. The lime itself is then removed by reaction with  $\text{CO}_2$  to precipitate calcium carbonate.

Field trials have been conducted for an experimental agricultural use for hydrated lime as an additive to crop residues, such as corn stover, to produce cattle feed that can replace a substantial portion of the grain normally fed to cattle. The crop residue is ground, treated with hydrated lime slurry, and then stored in an oxygen-free container—typically a plastic “ag bag” or a bunker—for at least a week. The hydrated lime makes the crop residue digestible by the cattle. This treated crop residue can replace about 20% of grain fed to the cattle and, with the further addition of wet distiller grains (byproducts of corn ethanol production) to provide protein, the treated crop residue may be able to replace more than 60% of the grain feed (Archer Daniels Midland Co., 2016). The extent of lime use in this sector in 2015 was unknown.

Hydrated lime is used in oil and gas drilling as a source of alkalinity and calcium in both oil- and water-base drilling fluids. Drilling fluid applications include increasing the pH, providing excess lime as an alkalinity buffer, flocculating bentonite drilling muds, removing soluble carbonate ( $\text{CO}_3^{2-}$ ) ions, controlling corrosion, and activating fatty-acid oil-base mud additives (M-I LLC, 2011).

In the construction sector, hydrated lime is used in hot mix asphaltic concrete as an antistripping agent. Stripping is generally defined as a loss of adhesion between the aggregate surface and the asphalt binder in the presence of water. Lime also is used in cold, in-place recycling for the rehabilitation of distressed asphaltic concrete pavements. Existing asphaltic concrete pavement is pulverized using a milling machine, and a hot lime slurry is added along with asphalt emulsion. The cold recycled mix is placed and compacted by conventional paving equipment, which produces a smooth base course for the new asphaltic concrete surface. In 2015, sales of lime for use in asphaltic concrete decreased by 5% compared with those for 2014 (table 3).

Hydrated lime and quicklime also are used to stabilize fine-grained soils in place of materials that are employed as subbases, such as hydraulic clay fills or otherwise poor-quality clay and

silty materials obtained from cuts or borrow pits. Lime also is used in base stabilization, which includes upgrading the strength and consistency properties of aggregates that may be judged unusable or marginal without stabilization. Common applications for lime stabilization include the construction of airfields, building foundations, earthen dams, parking areas, and roads.

Lime sales for soil stabilization tend to be cyclical, especially in major market areas such as Texas. In the soil stabilization market, lime competes with portland cement, cement kiln dust, fly ash, and other additives (liquid enzymes, for example). The choice of material for soil stabilization depends on availability, price, contract specifications, soil chemistry, and State and Federal funding in the case of highway construction projects. According to the U.S. Census Bureau (2016), public spending on highway and street construction was \$89.6 billion in 2015, up from the \$84 billion spent in 2014. The amount of lime consumed for soil stabilization in 2015 increased by 9% compared with that of 2014 (table 3).

Hydrated lime is used in the traditional building sector in some mortars, plasters, and stuccos. Standard masonry cement mortars that include lime exhibit superior workability balanced with appropriate compressive strength, as well as low water permeability and superior bond strength. Lime is a major constituent in some exterior and interior plasters and stuccos, enhancing the durability, strength, and workability of these finishes. A small amount of hydrated lime also is used in the renovation of old structures built with lime mortars, which were commonplace before the development of portland cement mortars. Modern portland cement-base mortars are incompatible with old lime mortars. Hydrated lime also is used to make synthetic hydraulic lime, which is produced by blending powdered hydrated lime with pulverized pozzolanic or hydraulic materials.

U.S. construction spending can be a rough indicator of lime consumption in building materials from year to year. The U.S. Census Bureau collects data on spending for private and public residential construction and 16 categories of nonresidential construction. In 2015, the U.S. value of private residential construction increased by 12.6% and that of nonresidential construction increased by 12.0% when compared with those of 2014. The value of total public construction (residential and nonresidential) increased by 5.6% compared with that in 2014 (U.S. Census Bureau, 2016; table 2). Almost all lime sold or used in 2015 for building use was in the form of hydrate [266,000 t (table 4) out of 272,000 t of total lime in 2014 (table 3)]. In 2015, the total amount of lime consumed in building materials, such as in aerated concrete, mortar, plaster, and whitewash, increased slightly compared with those of 2014 (table 3). Most of the lime sold or used for construction uses was produced at a few plants in Nevada, Ohio, Texas, and Wisconsin.

Dead-burned dolomite, also called refractory lime, is used as a component in tar-bonded refractory brick or monolithics manufactured for use in BOFs. Refractory brick also is used in the lining of many treatment and casting ladles, in cement clinker kilns, in argon-oxygen decarburization and vacuum-oxygen decarburization converters, in EAFs, and in continuous steel casting. The data on dead-burned dolomite reported in table 3 were rounded to one significant digit to avoid disclosing

company proprietary data; unrounded data show that the consumption of dead-burned dolomite in 2015 was 14% less than that of 2014. Magnesita Refractories Co. at its York, PA, plant, and Carmeuse at its Millersville, OH, plant were the only significant domestic producers of dead-burned dolomite. Although dead-burned dolomite is the primary form of lime used in refractories, hydrated lime may be used to produce silica refractory brick used to line industrial furnaces.

## Prices

The USGS calculates unit values of lime products from the quantity and value data reported for lime sold or used by the lime producers on a free-on-board plant basis, including the cost of containers. These provide average values that eliminate variables such as potentially significant differences between list prices and individual supply contracts. There are no published lime prices in trade publications, so historically the data listed in table 5 have been used as representative of U.S. lime prices. To avoid revealing company proprietary data, value data for dead-burned dolomite have not been reported separately but are included within the weighted average of all types of lime. The total weighted average price of all quicklime and hydrate sold or used in 2015 increased slightly by \$1.60 per metric ton. Prices for most types of lime sold increased slightly in 2015 compared with those for 2014; the increases ranged from \$0.90 to \$1.50 per metric ton, except for high-calcium hydrate, which increased by \$4.50 per metric ton, and high-calcium quicklime, which remained unchanged. With the exception of the high-calcium hydrate and quicklime prices, the annual increases in 2015 were the smallest reported during the past 10 years, during which the total annual average price increased by \$4.90 per metric ton, or by 5.9%, per year.

## Foreign Trade

The United States exported and imported calcined dolomite (dolomitic lime), hydrated lime (slaked lime), hydraulic lime, and quicklime. Total exports and imports of lime were very small—each about 2%—compared with the total amount produced domestically in 2015. Total exports of lime in 2015 were 346,000 t valued at \$62.5 million (table 6). About 94% of exports went to Canada, with most of the remaining exports going to Belgium (2%), Mexico (2%), and Russia (1%). Total imports of lime were 391,000 t valued at \$64.6 million (table 7), with about 95% from Canada, nearly 5% from Mexico, and less than 1% from other countries. Canada provided nearly all of the high-calcium quicklime and dolomitic (calcined dolomite) lime and 63% of slaked lime imports.

No tariffs are placed on imports of hydraulic lime, quicklime, and slaked lime from countries with normal trade relations (NTR) with the United States. A 3% ad valorem tariff is placed on imports of calcined dolomite from NTR countries.

## World Review

In 2015, global lime production was estimated to be 350 Mt, not significantly changed from overall levels in 2012–14 (table 8). The leading lime-producing countries were China (66%), the United States (5%), India (5%), Russia (3%), and

Brazil (2%). Lime is mostly traded on a regional basis because it is a low-value, bulk, and reactive product that could not be shipped long distances and compete with lime produced locally. Most countries have limestone or dolomite deposits and are able to manufacture lime for their own consumption. There may be some trade between countries on a regional basis where distances are not too great, such as within the European Union, or to supply lime products of a quality not locally available.

With the exception of some industrialized nations, accurate lime production data for individual countries are difficult to obtain and are commonly incomplete. In addition to production by large commercial lime companies, lime is produced by small-scale manufacturers operating simple kilns to supply local consumers and by industries producing lime for internal consumption. Also, there is common misreporting of crushed limestone production data as lime. In some cases, lime sales data have been used as a proxy for country production figures.

**Canada.**—In November, Graymont submitted an environmental assessment application for a proposed lime plant and limestone quarry near Giscome, British Columbia. The lime plant would initially be composed of one vertical kiln with a production capacity of 200,000 metric tons per year (t/yr) and a targeted startup in 2018, pending regulatory approval. Should future market conditions warrant, two additional 200,000-t/yr kilns could be built (Graymont Ltd., 2015b, 2016b).

**New Zealand.**—In June, Graymont purchased two New Zealand-based producers—McDonald's Lime Ltd. and Taylor's Lime Co. Ltd. As a result, Graymont owned the following four operations in New Zealand: the Makareao lime plant and limestone quarry near North Otago (South Island); the Oparure limestone quarry near Te Kuiti (North Island); the Otorohanga lime plant, which is 20 kilometers north of the Oparure limestone quarry (North Island); and the Te Kuiti lime plant in Te Kuiti (North Island). Limestone from the Oparure quarry supplies the Otorohanga and Te Kuiti lime plants (Graymont Ltd., 2015a, 2016c).

## Outlook

Economic forecasts predict sustained growth in the domestic economy in terms of growth in the U.S. real gross domestic product (GDP). The U.S. real GDP is forecast to grow at a rate of about 2% annually in 2016–18 (World Bank, The, 2016). Lime sales in markets such as chemical and industrial, construction, and steel are expected to increase with improvements in the overall economy.

The outlook for FGT (lime's second-leading market) is more difficult to predict. With the recent boom in natural gas exploration, large increases in natural gas reserves, and low natural gas prices, U.S. electric utilities have increasingly shifted their fuel use from coal to natural gas. Natural gas has the advantage of causing lower levels of air emissions than coal and, as a result, does not usually require SO<sub>2</sub> scrubbing, which could lead to decreased FGT lime consumption. The U.S. Energy Information Administration (2016) forecast the breakout of total domestic utility-scale electricity generation in 2016 would be 34% from natural gas and 30% from coal. In 2015, both fuels supplied 33% of total U.S. electricity generation. In 2017, natural gas and coal were forecast to generate 33% and 31% of electricity, respectively.

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TABLE 1  
SALIENT LIME STATISTICS<sup>1</sup>

|  | 2011                 | 2012      | 2013                 | 2014                   | 2015                 |
|--|----------------------|-----------|----------------------|------------------------|----------------------|
| United States: <sup>2</sup>                              |                      |           |                      |                        |                      |
| Number of plants <sup>3</sup>                            | 87                   | 87        | 85                   | 86                     | 86                   |
| Lime sold or used by producers:                          |                      |           |                      |                        |                      |
| Quantity:  |                      |           |                      |                        |                      |
| Quicklime:   |                      |           |                      |                        |                      |
| High-calcium thousand metric tons                        | 13,900               | 13,600    | 13,800               | 14,100 <sup>r</sup>    | 13,100               |
| Dolomitic do.  | 2,690                | 2,790     | 2,850 <sup>r</sup>   | 2,740 <sup>r</sup>     | 2,550                |
| Total do.  | 16,600               | 16,300    | 16,600               | 16,800                 | 15,600               |
| Hydrated lime:   |                      |           |                      |                        |                      |
| High-calcium do.   | 2,010                | 2,000     | 2,050                | 2,190                  | 2,150                |
| Dolomitic do.  | 230                  | 253       | 260                  | 279                    | 279                  |
| Total do.  | 2,240                | 2,260     | 2,310                | 2,470                  | 2,430                |
| Dead-burned dolomite <sup>4</sup> do.                    | 200                  | 200       | 200                  | 200                    | 200                  |
| Total do.  | 19,100               | 18,800    | 19,200               | 19,500                 | 18,300               |
| Value <sup>5</sup> thousand dollars                      | 2,130,000            | 2,230,000 | 2,320,000            | 2,390,000 <sup>r</sup> | 2,290,000            |
| Average value dollars per metric ton                     | 111.50               | 118.50    | 121.10               | 122.40                 | 125.30               |
| Lime sold by producers:                                  |                      |           |                      |                        |                      |
| Quantity:  |                      |           |                      |                        |                      |
| Quicklime <sup>6</sup> thousand metric tons              | 15,400               | 15,200    | 15,500               | 15,700                 | 14,500               |
| Hydrated lime do.  | 2,240                | 2,250     | 2,310                | 2,470                  | 2,430                |
| Total do.  | 17,700               | 17,500    | 17,800               | 18,100                 | 17,000               |
| Value <sup>5</sup> thousand dollars                      | 1,950,000            | 2,050,000 | 2,140,000            | 2,210,000              | 2,110,000            |
| Lime used by producers:                                  |                      |           |                      |                        |                      |
| Quantity thousand metric tons                            | 1,430                | 1,340     | 1,380 <sup>r</sup>   | 1,400 <sup>r</sup>     | 1,280                |
| Value <sup>5</sup> thousand dollars                      | 183,000              | 177,000   | 187,000 <sup>r</sup> | 180,000 <sup>r</sup>   | 176,000              |
| Exports: <sup>7</sup>                                    |                      |           |                      |                        |                      |
| Quantity thousand metric tons                            | 231                  | 212       | 270                  | 320 <sup>r</sup>       | 346                  |
| Value <sup>8</sup> thousand dollars                      | 40,100               | 36,700    | 48,200               | 57,600 <sup>r</sup>    | 62,500               |
| Imports for consumption: <sup>7</sup>                    |                      |           |                      |                        |                      |
| Quantity thousand metric tons                            | 512                  | 468       | 394                  | 414                    | 391                  |
| Value <sup>9</sup> thousand dollars                      | 69,900               | 68,300    | 64,100               | 65,200 <sup>r</sup>    | 64,600               |
| Consumption, apparent <sup>10</sup> thousand metric tons | 19,400               | 19,100    | 19,300               | 19,600 <sup>r</sup>    | 18,300               |
| World production do.                                     | 330,000 <sup>r</sup> | 340,000   | 350,000              | 350,000 <sup>r</sup>   | 350,000 <sup>c</sup> |

<sup>r</sup>Estimated. <sup>r</sup>Revised. do. Ditto.

<sup>1</sup>Data are rounded to no more than three significant digits, except world production data, which are rounded to two significant digits, and average values; may not add to totals shown. Excludes regenerated lime.

<sup>2</sup>Includes Puerto Rico.

<sup>3</sup>Includes most producer-owned hydrating plants not located at lime plants.

<sup>4</sup>Data are rounded to no more than one significant digit to avoid disclosing company proprietary data.

<sup>5</sup>Selling value, free-on-board plant.

<sup>6</sup>Includes dead-burned dolomite.

<sup>7</sup>Source: U.S. Census Bureau.

<sup>8</sup>Free alongside ship valuation.

<sup>9</sup>Cost, insurance, and freight valuation.

<sup>10</sup>Defined as sold or used plus imports minus exports.



TABLE 2  
LIME SOLD OR USED BY PRODUCERS IN THE UNITED STATES, BY U.S. CENSUS BUREAU REGION

| Region or division and year     | Quantity                        |   |                              | Percent of total | Value                    |                  |
|---------------------------------|---------------------------------|---|------------------------------|------------------|--------------------------|------------------|
|                                 | Hydrated (thousand metric tons) | Quicklime <sup>1</sup> (thousand metric tons) | Total (thousand metric tons) |                  | Total (thousand dollars) | Percent of total |
| 2014:                           |                                 |   |                              |                  |                          |                  |
| Northeast <sup>2</sup>          | 170                             | 1,010   | 1,180                        | 6                | 163,000                  | 7                |
| Midwest <sup>3</sup>            | 887                             | 6,880 <sup>r</sup>                            | 7,770 <sup>r</sup>           | 40               | 939,000 <sup>r</sup>     | 39               |
| South:                          |                                 |   |                              |                  |                          |                  |
| South Atlantic <sup>4</sup>     | 213                             | 591   | 804                          | 4                | 109,000                  | 5                |
| East South Central <sup>5</sup> | 224                             | 4,410   | 4,630                        | 24               | 531,000                  | 22               |
| West South Central <sup>6</sup> | 739                             | 1,260   | 2,000                        | 10               | 227,000                  | 10               |
| West <sup>7</sup>               | 238                             | 2,890   | 3,130                        | 16               | 419,000                  | 18               |
| Total                           | 2,470                           | 17,000  | 19,500                       | 100              | 2,390,000 <sup>r</sup>   | 100              |
| 2015:                           |                                 |   |                              |                  |                          |                  |
| Northeast <sup>2</sup>          | 175                             | 892   | 1,070                        | 6                | 148,000                  | 7                |
| Midwest <sup>3</sup>            | 874                             | 6,080   | 6,960                        | 38               | 871,000                  | 39               |
| South:                          |                                 |   |                              |                  |                          |                  |
| South Atlantic <sup>4</sup>     | 209                             | 561   | 770                          | 4                | 105,000                  | 5                |
| East South Central <sup>5</sup> | 215                             | 4,340   | 4,560                        | 25               | 526,000                  | 23               |
| West South Central <sup>6</sup> | 692                             | 1,210   | 1,900                        | 10               | 219,000                  | 9                |
| West <sup>7</sup>               | 267                             | 2,740   | 3,000                        | 16               | 418,000                  | 18               |
| Total                           | 2,430                           | 15,800  | 18,300                       | 100              | 2,290,000                | 100              |

<sup>r</sup>Revised.

<sup>1</sup>Includes dead-burned dolomite.

<sup>2</sup>Production in Massachusetts and Pennsylvania.

<sup>3</sup>Production in Indiana, Iowa, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

<sup>4</sup>Production in Florida, Georgia, Puerto Rico, Virginia, and West Virginia.

<sup>5</sup>Production in Alabama, Kentucky, and Tennessee.

<sup>6</sup>Production in Arkansas, Louisiana, Oklahoma, and Texas.

<sup>7</sup>Production in Arizona, California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

TABLE 3  
LIME SOLD OR USED BY PRODUCERS IN THE  
UNITED STATES, BY USE<sup>1,2,3</sup>

(Thousand metric tons)

| Use  | 2014               | 2015   |
|--|--------------------|--------|
| <b>Chemical and industrial:</b>                    |                    |        |
| Fertilizer, including aglime                       | 82                 | 77     |
| Glass  | 186                | 178    |
| Paper and pulp <sup>4</sup>                        | 942                | 943    |
| Precipitated calcium carbonate <sup>4</sup>        | 803                | 798    |
| Sugar refining <sup>4</sup>                        | 647                | 640    |
| Other chemical and industrial <sup>5</sup>         | 1,590              | 1,580  |
| Total  | 4,250              | 4,220  |
| <b>Metallurgical:</b>                              |                    |        |
| <b>Steel and iron:</b>                             |                    |        |
| Basic oxygen furnaces <sup>4</sup>                 | 2,470 <sup>r</sup> | 2,140  |
| Electric arc furnaces                              | 3,150              | 2,570  |
| Other steel and iron                               | 322                | 251    |
| Total  | 5,940 <sup>r</sup> | 4,960  |
| Nonferrous metallurgy <sup>6</sup>                 | 1,390              | 1,330  |
| Total metallurgical                                | 7,330 <sup>r</sup> | 6,280  |
| <b>Construction:</b>                               |                    |        |
| Asphalt  | 207                | 196    |
| Building uses                                      | 269                | 272    |
| Soil stabilization                                 | 1,220              | 1,330  |
| Other construction                                 | 43                 | 62     |
| Total  | 1,740              | 1,860  |
| <b>Environmental:</b>                              |                    |        |
| <b>Flue gas treatment:</b>                         |                    |        |
| Utility powerplants                                | 3,660              | 3,310  |
| Incinerators                                       | 194                | 235    |
| Industrial boilers and other flue gas treatment    | 164                | 213    |
| Total  | 4,020              | 3,760  |
| <b>Sludge treatment:</b>                           |                    |        |
| Sewage   | 110                | 104    |
| Other, industrial and hazardous                    | 196                | 262    |
| Total  | 306                | 365    |
| <b>Water treatment:</b>                            |                    |        |
| Acid-mine drainage                                 | 85                 | 88     |
| Drinking water                                     | 861                | 907    |
| Wastewater   | 517                | 426    |
| Total  | 1,460              | 1,420  |
| Other environmental                                | 190                | 155    |
| Total environmental                                | 5,980              | 5,700  |
| Refractories (dead-burned dolomite) <sup>4,7</sup> | 219                | 189    |
| Grand total  | 19,500             | 18,300 |

<sup>r</sup>Revised.

<sup>1</sup>Includes Puerto Rico.

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown. Excludes lime kiln dust and regenerated lime.

<sup>3</sup>The U.S. Geological Survey does not collect value data by end use; in previous years, value data were estimated.

<sup>4</sup>Includes lime sold or used, where "used" denotes lime produced for internal company use.

<sup>5</sup>May include alkalis, calcium carbide and cyanamide, calcium hypochlorite, citric acid, food (animal or human), oil and grease, oil well drilling, petrochemicals tanning, and other uses. Magnesia is included here to avoid disclosing proprietary data.

<sup>6</sup>Includes alumina and bauxite, magnesium, metals concentration (copper and gold), and other nonferrous uses.

<sup>7</sup>Data are rounded to no more than one significant digit to avoid disclosing company proprietary data.

TABLE 4  
HYDRATED LIME SOLD OR USED IN THE  
UNITED STATES, BY END USE<sup>1,2,3,4</sup>

(Thousand metric tons)

| Use   | 2014  | 2015  |
|---|-------|-------|
| Chemical and industrial                         | 643   | 564   |
| Construction:                                   |       |       |
| Asphalt   | 182   | 172   |
| Building uses                                   | 256   | 266   |
| Soil stabilization                              | 465   | 466   |
| Other construction                              | 6     | 21    |
| Total   | 909   | 925   |
| Environmental:                                  |       |       |
| Flue gas treatment:                             |       |       |
| Utility powerplants                             | 269   | 260   |
| Incinerators                                    | 31    | 30    |
| Industrial boilers and other flue gas treatment | 56    | 80    |
| Total   | 356   | 369   |
| Sludge treatment:                               |       |       |
| Sewage  | 30    | 29    |
| Other sludge treatment                          | 69    | 84    |
| Total   | 99    | 113   |
| Water treatment:                                |       |       |
| Acid-mine drainage                              | 27    | 38    |
| Drinking water                                  | 157   | 159   |
| Wastewater                                      | 183   | 146   |
| Total   | 367   | 342   |
| Other environmental                             | 52    | 54    |
| Metallurgy                                      | 44    | 65    |
| Grand total                                     | 2,470 | 2,430 |

<sup>1</sup>Includes Puerto Rico.

<sup>2</sup>Data are rounded to no more than three significant digits; may not add to totals shown. Excludes regenerated lime.

<sup>3</sup>The U.S. Geological Survey does not collect value data by end use; in previous years, value data were estimated.

<sup>4</sup>Includes hydrated lime sold or used, where "used" denotes lime produced for internal company use in the building, chemical and industrial, and metallurgical sectors.

TABLE 5  
LIME PRICES IN THE UNITED STATES, BY TYPE<sup>1,2</sup>

| Type                           | 2014                   |                       | 2015                   |                       |
|--------------------------------|------------------------|-----------------------|------------------------|-----------------------|
|                                | Dollars per metric ton | Dollars per short ton | Dollars per metric ton | Dollars per short ton |
| Sold or used:                  |                        |                       |                        |                       |
| Quicklime <sup>3</sup>         | 119.10                 | 108.00                | 121.50                 | 110.30                |
| Hydrated lime                  | 142.20                 | 129.00                | 146.40                 | 132.80                |
| Weighted average all types     | 122.40                 | 111.10                | 125.30                 | 113.70                |
| Sold:                          |                        |                       |                        |                       |
| High-calcium quicklime         | 116.60                 | 105.80                | 118.30                 | 107.60                |
| Dolomitic quicklime            | 128.60                 | 116.60                | 129.90                 | 117.80                |
| Average quicklime <sup>3</sup> | 118.40                 | 107.50                | 120.40                 | 109.20                |
| High-calcium hydrated lime     | 138.90                 | 126.00                | 143.40                 | 130.10                |
| Dolomitic hydrated lime        | 168.50                 | 152.80                | 170.00                 | 154.20                |
| Average hydrated lime          | 142.30                 | 129.10                | 146.40                 | 132.90                |
| Weighted average all types     | 121.90                 | 110.60                | 124.40                 | 112.90                |

<sup>1</sup>Average value per ton, free-on-board plant, including cost of containers.

<sup>2</sup>Unit values in metric and short tons were rounded independently.

<sup>3</sup>Includes dead-burned dolomite.

TABLE 6  
U.S. EXPORTS OF LIME, BY TYPE<sup>1</sup>

(Metric tons and dollars)

| Type and country             | 2014                 |                         | 2015     |                    |
|------------------------------|----------------------|-------------------------|----------|--------------------|
|                              | Quantity             | Value <sup>2</sup>      | Quantity | Value <sup>2</sup> |
| <b>Calcined dolomite:</b>    |                      |                         |          |                    |
| Argentina                    | 462                  | 158,000                 | 280      | 96,700             |
| Belgium                      | 187                  | 46,900                  | 6,730    | 1,800,000          |
| Brazil                       | 1,840                | 628,000                 | 24       | 15,000             |
| Canada                       | 60,700               | 12,400,000              | 52,500   | 12,200,000         |
| Ecuador                      | 3                    | 8,240                   | --       | --                 |
| Malaysia                     | 102                  | 25,600                  | --       | --                 |
| Mexico                       | 356                  | 113,000                 | 384      | 149,000            |
| Taiwan                       | 19                   | 21,200                  | --       | --                 |
| United Arab Emirates         | 99                   | 64,900                  | 21       | 18,100             |
| Venezuela                    | 63                   | 63,300                  | 33       | 25,000             |
| Other                        | 15 <sup>r</sup>      | 2,930 <sup>r</sup>      | --       | --                 |
| Total                        | 63,900 <sup>r</sup>  | 13,600,000 <sup>r</sup> | 60,000   | 14,300,000         |
| <b>Hydraulic lime:</b>       |                      |                         |          |                    |
| Austria                      | --                   | --                      | 6        | 7,160              |
| Bahamas, The                 | 22                   | 7,020                   | 15       | 3,510              |
| Canada                       | 6,260                | 1,420,000               | 9,380    | 2,240,000          |
| China                        | --                   | --                      | 13       | 21,100             |
| France                       | --                   | --                      | 6        | 8,430              |
| Germany                      | --                   | --                      | 2        | 2,830              |
| Japan                        | --                   | --                      | 5        | 6,000              |
| Mexico                       | 6                    | 10,400                  | 47       | 41,200             |
| Sweden                       | --                   | --                      | 6        | 7,660              |
| Venezuela                    | --                   | --                      | 3        | 3,490              |
| Other                        | 110 <sup>r</sup>     | 341,000 <sup>r</sup>    | (3)      | 3,120              |
| Total                        | 6,400                | 1,780,000               | 9,480    | 2,350,000          |
| <b>Quicklime:</b>            |                      |                         |          |                    |
| Bahamas, The                 | --                   | --                      | 21       | 6,270              |
| Canada                       | 202,000              | 30,300,000 <sup>r</sup> | 247,000  | 39,000,000         |
| Chile                        | --                   | --                      | 1,160    | 347,000            |
| Colombia                     | --                   | --                      | 33       | 35,700             |
| Costa Rica                   | 221                  | 85,400 <sup>r</sup>     | 215      | 86,100             |
| Ireland                      | 278                  | 338,000                 | 14       | 19,200             |
| Mexico                       | 7,700                | 1,030,000               | 7,480    | 1,070,000          |
| Netherlands                  | 99                   | 138,000                 | 44       | 47,200             |
| Russia                       | 3,600                | 2,090,000               | 2,600    | 507,000            |
| Singapore                    | --                   | --                      | 18       | 15,100             |
| Other                        | 24 <sup>r</sup>      | 42,600 <sup>r</sup>     | 24       | 35,600             |
| Total                        | 214,000              | 34,000,000 <sup>r</sup> | 258,000  | 41,200,000         |
| <b>Slaked lime, hydrate:</b> |                      |                         |          |                    |
| Bahamas, The                 | 45                   | 12,400                  | 70       | 20,400             |
| Bermuda                      | 34                   | 6,530                   | 51       | 9,930              |
| Canada                       | 24,000               | 5,340,000 <sup>r</sup>  | 16,400   | 3,840,000          |
| Chile                        | --                   | --                      | 116      | 80,500             |
| Costa Rica                   | 452                  | 188,000                 | 293      | 129,000            |
| Nigeria                      | 251                  | 73,600                  | 137      | 43,400             |
| Oman                         | 9,470                | 2,100,000               | 363      | 80,000             |
| Panama                       | 197                  | 96,000                  | 73       | 19,000             |
| Trinidad and Tobago          | --                   | --                      | 89       | 28,000             |
| Venezuela                    | 185                  | 43,200                  | 166      | 35,600             |
| Other                        | 298 <sup>r</sup>     | 407,000 <sup>r</sup>    | 178      | 356,000            |
| Total                        | 35,000 <sup>r</sup>  | 8,270,000 <sup>r</sup>  | 18,000   | 4,640,000          |
| Grand total                  | 320,000 <sup>r</sup> | 57,600,000 <sup>r</sup> | 346,000  | 62,500,000         |

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Free alongside ship valuation.

<sup>3</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 7  
U.S. IMPORTS FOR CONSUMPTION OF LIME, BY TYPE<sup>1</sup>

(Metric tons and dollars)

| Type and country             | 2014                |                         | 2015     |                    |
|------------------------------|---------------------|-------------------------|----------|--------------------|
|                              | Quantity            | Value <sup>2</sup>      | Quantity | Value <sup>2</sup> |
| <b>Calcined dolomite:</b>    |                     |                         |          |                    |
| Brazil                       | 91                  | 11,000                  | --       | --                 |
| Canada                       | 44,300 <sup>r</sup> | 7,500,000 <sup>r</sup>  | 48,200   | 7,600,000          |
| China                        | 15                  | 9,630                   | --       | --                 |
| Germany                      | 29                  | 14,400                  | 40       | 18,300             |
| Italy                        | 151                 | 105,000 <sup>r</sup>    | 52       | 19,500             |
| Total                        | 44,600              | 7,640,000 <sup>r</sup>  | 48,300   | 7,630,000          |
| <b>Hydraulic lime:</b>       |                     |                         |          |                    |
| Canada                       | 171                 | 26,600 <sup>r</sup>     | 60       | 7,300              |
| Dominican Republic           | 245                 | 64,500 <sup>r</sup>     | 148      | 39,000             |
| France                       | 209                 | 115,000 <sup>r</sup>    | 350      | 163,000            |
| Germany                      | (3)                 | 2,280                   | 32       | 6,860              |
| Greece                       | 1                   | 3,690                   | --       | --                 |
| Italy                        | 21                  | 5,960 <sup>r</sup>      | 19       | 2,630              |
| Japan                        | --                  | --                      | 20       | 77,800             |
| United Kingdom               | --                  | --                      | 16       | 8,140              |
| Total                        | 647                 | 218,000 <sup>r</sup>    | 645      | 305,000            |
| <b>Quicklime:</b>            |                     |                         |          |                    |
| Canada                       | 319,000             | 46,800,000 <sup>r</sup> | 292,000  | 45,500,000         |
| Chile                        | --                  | --                      | 89       | 10,700             |
| China                        | 131                 | 110,000                 | 55       | 39,200             |
| Dominican Republic           | --                  | --                      | 2        | 11,900             |
| France                       | 1                   | 2,020                   | 34       | 16,100             |
| Germany                      | 155                 | 128,000                 | 116      | 96,100             |
| Japan                        | --                  | --                      | 71       | 68,700             |
| Mexico                       | 1,450               | 264,000 <sup>r</sup>    | 804      | 124,000            |
| Thailand                     | 20                  | 53,600                  | 18       | 49,100             |
| United Kingdom               | 3                   | 30,700 <sup>r</sup>     | 2        | 17,900             |
| Other                        | 38 <sup>r</sup>     | 37,300 <sup>r</sup>     | (3)      | 70,500             |
| Total                        | 320,000             | 47,500,000 <sup>r</sup> | 293,000  | 46,000,000         |
| <b>Slaked lime, hydrate:</b> |                     |                         |          |                    |
| Belgium                      | 324                 | 128,000 <sup>r</sup>    | 207      | 71,000             |
| Canada                       | 33,700              | 6,640,000 <sup>r</sup>  | 30,800   | 6,230,000          |
| China                        | 24                  | 7,820                   | 32       | 16,200             |
| France                       | 46                  | 71,000 <sup>r</sup>     | 106      | 157,000            |
| Germany                      | 22                  | 115,000 <sup>r</sup>    | 43       | 203,000            |
| Honduras                     | 165                 | 29,300 <sup>r</sup>     | 262      | 42,100             |
| Italy                        | 59                  | 171,000 <sup>r</sup>    | 124      | 306,000            |
| Mexico                       | 13,900              | 2,510,000 <sup>r</sup>  | 17,200   | 3,360,000          |
| Netherlands                  | 307                 | 151,000 <sup>r</sup>    | 269      | 133,000            |
| United Kingdom               | 6                   | 15,200 <sup>r</sup>     | 21       | 57,800             |
| Other                        | 132 <sup>r</sup>    | 94,700 <sup>r</sup>     | 25       | 36,900             |
| Total                        | 48,700              | 9,930,000 <sup>r</sup>  | 49,100   | 10,600,000         |
| Grand total                  | 414,000             | 65,200,000 <sup>r</sup> | 391,000  | 64,600,000         |

<sup>r</sup>Revised. -- Zero.

<sup>1</sup>Data are rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Cost, insurance, and freight valuation.

<sup>3</sup>Less than ½ unit.

Source: U.S. Census Bureau.

TABLE 8  
 QUICKLIME AND HYDRATED LIME, INCLUDING DEAD-BURNED DOLOMITE:  
 WORLD PRODUCTION, BY COUNTRY<sup>1,2</sup>

(Thousand metric tons)

| Country <sup>3</sup>                 | 2011                 | 2012                 | 2013                | 2014                 | 2015 <sup>e</sup>   |
|--------------------------------------|----------------------|----------------------|---------------------|----------------------|---------------------|
| Australia, sales <sup>c</sup>        | 2,200                | 2,200                | 2,100               | 2,000 <sup>r</sup>   | 2,000               |
| Austria                              | 801                  | 781 <sup>r</sup>     | 780 <sup>r</sup>    | 830 <sup>r</sup>     | 820                 |
| Belarus                              | 794                  | 747                  | 748                 | 769                  | 626 <sup>4</sup>    |
| Belgium <sup>5</sup>                 | 1,509                | 1,427                | 1,404               | 1,481 <sup>r</sup>   | 1,400               |
| Bosnia and Herzegovina               | 489                  | 398                  | 387                 | 428 <sup>r</sup>     | 423 <sup>4</sup>    |
| Brazil <sup>c</sup>                  | 8,235 <sup>4</sup>   | 8,300                | 8,350               | 8,300                | 8,300               |
| Bulgaria <sup>c</sup>                | 1,495 <sup>4</sup>   | 1,425 <sup>4</sup>   | 1,400               | 1,500                | 1,500               |
| Canada                               | 1,937                | 1,965                | 1,856               | 1,995 <sup>r</sup>   | 1,852 <sup>4</sup>  |
| Chile <sup>c</sup>                   | 860                  | 970                  | 950                 | 900                  | 910                 |
| China <sup>c</sup>                   | 200,000              | 220,000              | 230,000             | 230,000              | 230,000             |
| Croatia                              | 271                  | 207                  | 185                 | 205                  | 186 <sup>4</sup>    |
| Czech Republic                       | 1,093 <sup>r</sup>   | 956 <sup>r</sup>     | 951 <sup>r</sup>    | 1,052 <sup>r</sup>   | 1,000               |
| Egypt <sup>c</sup>                   | 750 <sup>r</sup>     | 800                  | 800                 | 750 <sup>r</sup>     | 720                 |
| Finland <sup>c</sup>                 | 456 <sup>4</sup>     | 450                  | 450                 | 460                  | 470                 |
| France                               | 3,900                | 3,900                | 3,900               | 3,900                | 3,800               |
| Germany                              | 7,113                | 6,672                | 6,883               | 6,390 <sup>r</sup>   | 6,400               |
| Hungary                              | 250                  | 230                  | 249                 | 272                  | 310                 |
| India <sup>c</sup>                   | 15,000               | 15,000               | 16,000              | 16,000               | 16,000              |
| Iran <sup>c</sup>                    | 2,800                | 2,800                | 2,800               | 2,800                | 2,800               |
| Ireland <sup>c</sup>                 | 300                  | 300                  | 290 <sup>r</sup>    | 270 <sup>r</sup>     | 260                 |
| Israel                               | 715                  | 770                  | 300                 | 250 <sup>r</sup>     | 554 <sup>4</sup>    |
| Italy <sup>c,5</sup>                 | 5,800                | 5,800                | 3,640               | 3,600                | 1,916 <sup>4</sup>  |
| Jamaica                              | 79 <sup>r</sup>      | 84 <sup>r</sup>      | 106 <sup>r</sup>    | 104 <sup>r</sup>     | 105 <sup>p</sup>    |
| Japan, quicklime only                | 8,005                | 7,581                | 7,619               | 7,911                | 7,336 <sup>4</sup>  |
| Kazakhstan                           | 960                  | 908                  | 869                 | 923 <sup>r</sup>     | 871 <sup>4</sup>    |
| Korea, Republic of <sup>c</sup>      | 5,100                | 5,200                | 5,000               | 5,100                | 5,100               |
| Malaysia, sales <sup>c</sup>         | 1,000                | 1,100                | 1,100               | 1,400                | 1,500               |
| Peru <sup>c</sup>                    | 220 <sup>r</sup>     | 220                  | 230                 | 240                  | 240                 |
| Poland                               | 2,036                | 1,799 <sup>r</sup>   | 1,709 <sup>r</sup>  | 1,817 <sup>r</sup>   | 1,942 <sup>4</sup>  |
| Romania                              | 1,679                | 1,708                | 1,698               | 1,723 <sup>r</sup>   | 1,907 <sup>4</sup>  |
| Russia <sup>c</sup>                  | 10,100 <sup>4</sup>  | 11,000 <sup>r</sup>  | 11,000 <sup>r</sup> | 11,000               | 11,000              |
| Serbia <sup>5</sup>                  | 274                  | 239                  | 279                 | 235 <sup>r</sup>     | 230                 |
| Slovakia                             | 971                  | 903                  | 813                 | 827 <sup>r</sup>     | 778 <sup>4</sup>    |
| Slovenia <sup>c</sup>                | 100                  | 100                  | 100                 | 100                  | 100                 |
| South Africa, burnt lime sales       | 1,539                | 1,209                | 1,187               | 1,255 <sup>r</sup>   | 1,115 <sup>4</sup>  |
| Spain, sales <sup>c</sup>            | 1,900                | 1,800                | 1,800 <sup>r</sup>  | 1,800 <sup>r</sup>   | 1,800               |
| Sweden <sup>c</sup>                  | 700                  | 700                  | 680 <sup>r</sup>    | 650 <sup>r</sup>     | 640                 |
| Taiwan                               | 318                  | 287                  | 282                 | 261                  | 211 <sup>4</sup>    |
| Thailand, sales <sup>c</sup>         | 800                  | 800                  | 800                 | 800                  | 780                 |
| Tunisia                              | 282                  | 340                  | 293                 | 253 <sup>r</sup>     | 260                 |
| Turkey, sales <sup>c</sup>           | 4,300                | 4,500                | 4,400 <sup>r</sup>  | 4,300 <sup>r</sup>   | 4,200               |
| Ukraine                              | 4,487                | 4,415                | 3,892               | 3,134 <sup>r</sup>   | 2,717 <sup>4</sup>  |
| United Arab Emirates <sup>c</sup>    | 340                  | 400                  | 450                 | 430                  | 460                 |
| United Kingdom <sup>c</sup>          | 1,500                | 1,500                | 1,500               | 1,600 <sup>r</sup>   | 1,600               |
| United States, including Puerto Rico | 19,100               | 18,800               | 19,200              | 19,500               | 18,300 <sup>4</sup> |
| Venezuela <sup>c</sup>               | 400                  | 400                  | 400                 | 360                  | 350                 |
| Vietnam <sup>c</sup>                 | 850 <sup>4</sup>     | 850                  | 850                 | 850                  | 840                 |
| Zambia <sup>c</sup>                  | 50                   | 250                  | 280                 | 300                  | 300                 |
| Other <sup>c,6</sup>                 | 1,700 <sup>r</sup>   | 1,800 <sup>r</sup>   | 1,900 <sup>r</sup>  | 2,000 <sup>r</sup>   | 1,900               |
| Total                                | 330,000 <sup>r</sup> | 350,000 <sup>r</sup> | 350,000             | 350,000 <sup>r</sup> | 350,000             |

See footnotes at end of table.

TABLE 8—Continued  
QUICKLIME AND HYDRATED LIME, INCLUDING DEAD-BURNED DOLOMITE:  
WORLD PRODUCTION, BY COUNTRY<sup>1,2</sup>

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<sup>6</sup>Estimated. <sup>p</sup>Preliminary. <sup>r</sup>Revised.

<sup>1</sup>World totals and estimated data are rounded to no more than two significant digits and U.S. production is rounded to no more than three significant digits; may not add to totals shown.

<sup>2</sup>Includes data available through August 3, 2017.

<sup>3</sup>In addition to the countries listed, Argentina, Chad, Congo (Kinshasa), Iraq, Lebanon, Mauritius, Mexico, Morocco, Nigeria, North Korea, Oman, Pakistan, Saudi Arabia, Syria, and several other nations produced lime, but output data are not reported; available general information was inadequate to make reliable estimates of output.

<sup>4</sup>Reported figure.

<sup>5</sup>Includes hydraulic lime.

<sup>6</sup>Includes Algeria, Azerbaijan (construction only), Cuba, Cyprus (hydrated), Denmark (sales), Eritrea, Ethiopia, Guatemala, Jordan, Kenya, Kuwait, Kyrgyzstan, Libya, Macedonia, Malawi, Moldova, Mongolia, Montenegro, New Zealand (sales), Nicaragua, Norway, Panama, Paraguay, Philippines, Portugal, Qatar, Senegal, Switzerland, Tanzania, Turkmenistan, Uganda, and Uruguay.