



## Fact Sheet

### **Bottled Water and Energy: Getting to 17 Million Barrels** December 2007

#### **Abstract**

The Pacific Institute finds that it took approximately **17 million barrels of oil equivalent** to produce plastic for bottled water consumed by Americans in 2006—enough energy to fuel more than 1 million American cars and light trucks for a year. **The widely cited 1.5 million barrel statistic is an error**, the result of a miscommunication between a journalist and a researcher in 2003. That researcher and others now stand by this updated assessment.

#### **Background**

As concern about the cost and environmental impact of bottled water grows, so does our understanding of the true nature of that impact. In 2007, media focus shifted to the energy involved in producing bottled water. A high profile *New York Times* editorial cited that an estimated 1.5 million barrels of oil equivalent were needed to produce the bottles for annual U.S. bottled water consumption.<sup>1</sup> This analysis did not jibe with that of the Pacific Institute or the Container Recycling Institute, both of whom have been researching bottled water for several years. A more recent, detailed assessment conducted by the Pacific Institute concludes the actual number is more than 10 times the incorrect figure. Approximately 17 million barrels of oil equivalent were needed to produce the plastic water bottles consumed by Americans in 2006—enough energy to fuel more than one million cars for a year. The Earth Policy Institute and the Container Recycling Institute, to whom the error has been attributed, have reviewed the new calculation and acknowledge this higher value is the accurate estimate.

#### **Bottled Water and Energy**

Bottled water requires energy throughout its life cycle. Energy is required to capture, treat, and send water to the bottling plant; fill, package, transport, and cool the bottled water; and recycle or dispose of the empty containers. Calculating the total amount of energy needed is complicated by the location of the water source, the location of the consumer, the type of material and packaging, the method of transportation, and other factors (See Figure 1). This fact sheet addresses the energy required to make the plastic materials used, and then to fabricate that plastic into the actual bottles the U.S. consumes—only two of the many energy-intensive stages in a water bottle's lifecycle (see Figure 1).

#### **PET Produced for 2006 U.S. Bottled Water Consumption**

According to the Beverage Marketing Corporation, Americans bought approximately 31.2 billion liters of bottled water in 2006.<sup>2</sup> Most of this retail water, which is sold in bottles ranging from the 8-ounce aquapods popular in school lunches to the multi-gallon bottles found in family refrigerators and office

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<sup>1</sup> "[In Praise of Tap Water](#)." *New York Times*. August 1, 2007. The 1.5 million barrel statistic was first reported in the September-October, 2003 issue of *E Magazine*, "[Message in a Bottle: Despite the Hype, Bottled Water is Neither Cleaner nor Greener Than Tap Water](#)." That story reported that the Container Recycling Institute estimated 1.5 million barrels of oil equivalent were required to produce the plastic for annual U.S. bottled water consumption. CRI's original calculation, however, estimated that the requirement was 15 million barrels of oil equivalent (the difference between the 15 and 17 million estimates can be attributed to increases in sales). CRI failed to correct the reporting error at the time of publication and since then, numerous news outlets have reprinted the error.

<sup>2</sup> Beverage Marketing Corporation, as quoted in "2006 Bottled Water Volume Exceeds 8 Billion Gallons," <http://www.qsrmagazine.com/articles/news/story.phtml?id=5347>; and Table, "US Bottled Water Market" at [http://www.fiberwater.com/industry\\_bwi.php](http://www.fiberwater.com/industry_bwi.php).

water coolers, is packaged in polyethylene terephthalate (PET) bottles. The amount of PET used per bottle depends on the style, thickness, and size of the bottle. An analysis by the Pacific Institute shows that an average one-liter bottle currently weighs approximately 38 grams, excluding the cap.<sup>3</sup> This estimate may be high as many bottlers have begun to move to lighter bottles for non-carbonated beverages. Assuming an average weight of around 32 grams per liter container, plus a modest addition for plastic used in packaging and production waste, the production of bottled water in 2006 required approximately one million metric tons of PET.

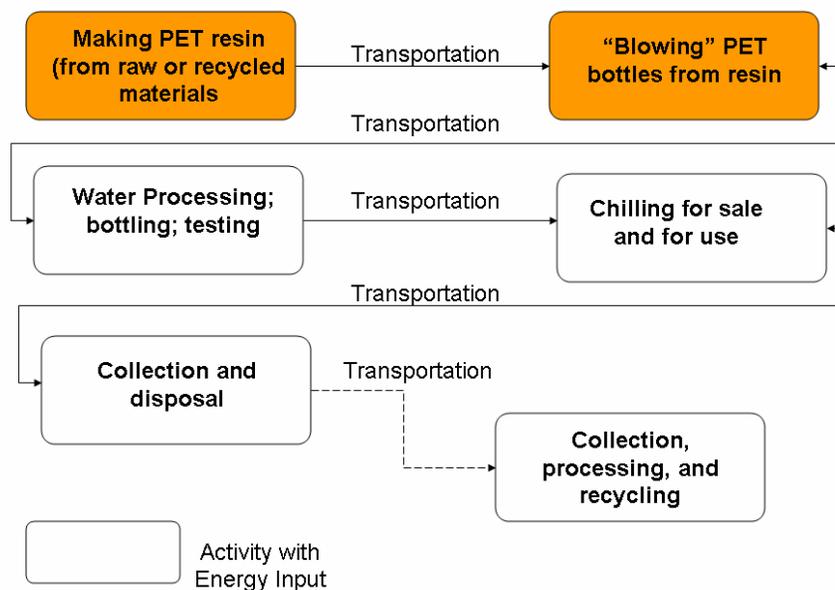
### Energy Required To Make PET Bottles

PET is produced from fossil fuels – typically natural gas and petroleum. The PET production process also relies on other energy sources, including thermal and electric sources. The European plastics manufacturing industry found that producing a ton of PET resin requires 83,000 MJ of energy.<sup>4</sup> They also estimate that transporting the resin and converting it into bottles requires an additional 20,000 MJ of energy per ton of PET.<sup>3</sup> When put together, the energy to produce and transport the PET resin, and then mold it into bottles, totals approximately 100,000 MJ per ton of PET.

### Conclusion and Summary: Energy Required for 2006 U.S. Bottled Water Consumption

Because bottled water required approximately 1 million tons of PET in 2006, those bottles required roughly 100 billion MJ of energy. A barrel of oil contains around 6,000 MJ, so producing those bottles required the equivalent of around 17 million barrels of oil. This is enough energy to fuel one million American cars for one year.

For more information about the Pacific Institute, visit [www.pacinst.org](http://www.pacinst.org).  
 For more information about the Institute's Integrity of Science initiative, visit [www.integrityofscience.org](http://www.integrityofscience.org).



**Figure 1.** Flow diagram showing examples of where energy is required during bottled water manufacturing, use, and disposal. Energy is required at each major stage, as well as with transportation between stages. This fact sheet only analyzes the first two orange boxes, which together require the equivalent of 17 million barrels of oil.

<sup>3</sup> Typical caps weigh around 2 grams and are not usually made of PET.

<sup>4</sup> I. Bousted. 2005. Eco-profiles of the European Plastics Industry: Polyethylene Terephthalate (PET), (Bottle grade). Plastics Europe. March. <http://lca.plasticseurope.org/petb5.htm>.