

Michigan is a leader in protecting water resources

The oil and gas industry is highly regulated by state and federal agencies and is required to ensure that water withdrawals used in the production process are safe and pose no risk to the environment or nearby residential wells.

An oil or natural gas operator intending to use a large volume of water (defined as 100,000 gallons or more per day over a 30 day period) is required to use the state's Water Withdrawal Assessment Tool to assure the water withdrawal will be safe. If the tool indicates a potential adverse impact, Michigan regulatory officials conduct a site-specific investigation and can require the operator to obtain water from other sources or to move the proposed water well. Approvals are not given if a proposed withdrawal is determined to negatively affect resources.

Stewardship and conservation

While Michigan is blessed with vast water resources, we have a responsibility to use them wisely. Michigan's oil and natural gas producers recognize conservation is a priority. We also are committed to ensuring the amount of water we use is proportionate to the amount readily available, so as to protect the environment and others needs for water.

The oil and natural gas industry continues to develop new technologies and methods for producing the energy we need while becoming more air, land and water friendly. In the future, we expect to do more to reduce water use and/or reuse / recycle the water used in our operations. These practices are good for business and good for Michigan.

DID YOU KNOW?

- Nearly 80 percent of Michigan homeowners use natural gas to heat their homes, compared to just 51 percent of U.S. households nationwide (source: U.S. Department of Energy).
- Often asked is the question about the water used in operations being lost to the environment forever, due to the fracturing fluid being left a mile or more underground – either during the hydraulic fracturing process or when disposing of flowback fluid. While this water is in fact “lost,” it is a very small portion of the water lost from the Great Lakes watershed. Other water uses in Michigan – primarily agriculture – transport 600 million gallons of water per day out of the watershed by evaporation or other processes (source: Great Lakes Commission, 2011 Great Lakes Annual Water Use Report, May 2013).
- Considering the water used to produce natural gas over a 20-year lifespan of a well, it is the most efficient of all base load energy resources. One-time water use during drilling and well completion pays off over the long-term with the energy it produces.

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Michigan Oil & Gas Producers Education Foundation

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WATER USE AND OIL AND NATURAL GAS PRODUCTION IN MICHIGAN

Michigan Oil & Gas Producers Education Foundation – Exploring Oil and Natural Gas through Education



Vital to our economy, quality of life, and environment

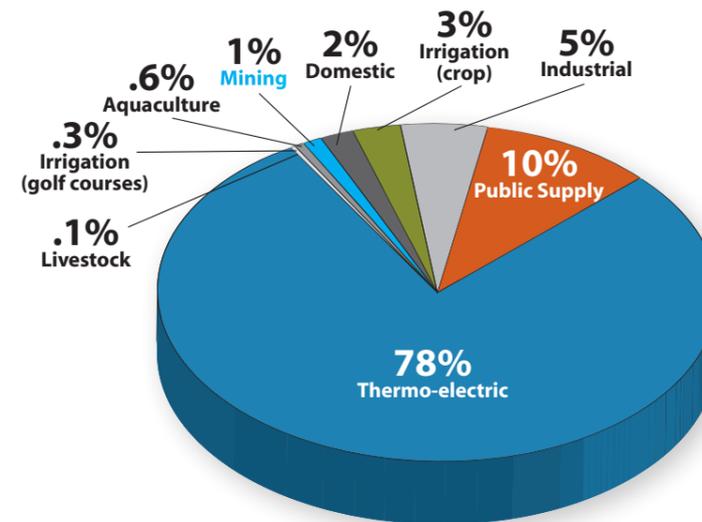
Water is vital to Michigan's economy and our way of life.

It is a key investment for creating the means to make our lives safe and comfortable, as well as other industries including:

- ◆ Auto manufacturing
- ◆ Chemical production
- ◆ Farming
- ◆ Food processing
- ◆ Energy generation

The primary use for water in modern oil and natural gas development is during the well drilling and completion phase. In some cases “completing the well” can include hydraulic fracturing. During hydraulic fracturing, water is pumped down the wellbore (pipe) under high pressure to create hairline fractures in extremely dense rock to release oil and natural gas.

Michigan Water Use (Millions Gallons/Day)



The oil and natural gas exploration and production industry is a very small part of water use. Oil and gas production is part of the mining sliver in the graph to the left. Mining, overall, including oil and gas production uses less than 1 percent of the water used statewide.

Source: Michigan DEQ 2004

Michigan's water usage

At first glance the amount of water used in hydraulic fracturing, particularly in shale gas formations, may appear substantial, but it is small when compared to other water uses. Unlike other uses, water used to produce natural gas through hydraulic fracturing is a one-time use that promotes efficient energy production for the next 20 years. It's an investment that pays off in the form of long-term, clean, reliable, and affordable energy.

Michigan uses more than 11 billion gallons of water each day, with nearly 80 percent of this used for thermoelectric power generation (source: MDEQ, 2004 Water Withdrawals for Major Water Uses in Michigan).

Water use for natural gas and oil production

The amount of water used in production depends on the type of well being installed and the geologic conditions in which it will produce oil and natural gas. In Michigan, water use for a single well can range from approximately 50,000 to upward of 10 million gallons, in rare cases. Not all natural gas or oil wells require hydraulic fracturing; water use will be less for those wells that do not.

- Vertical wells, which have been typical to Michigan, use less water than horizontal wells because they are not as long. These wells typically require 50,000 – 100,000 gallons of water to drill and complete, including, if necessary, the hydraulic fracturing phase.
- Horizontal wells – vertical wells that have a lateral leg connected to the end to reach more natural gas or oil through a single well – use more water because the wellbore has more exposure to the productive rock formation. These wells typically require 2–6 million gallons of water, and in some cases can require as much as 20 million gallons.

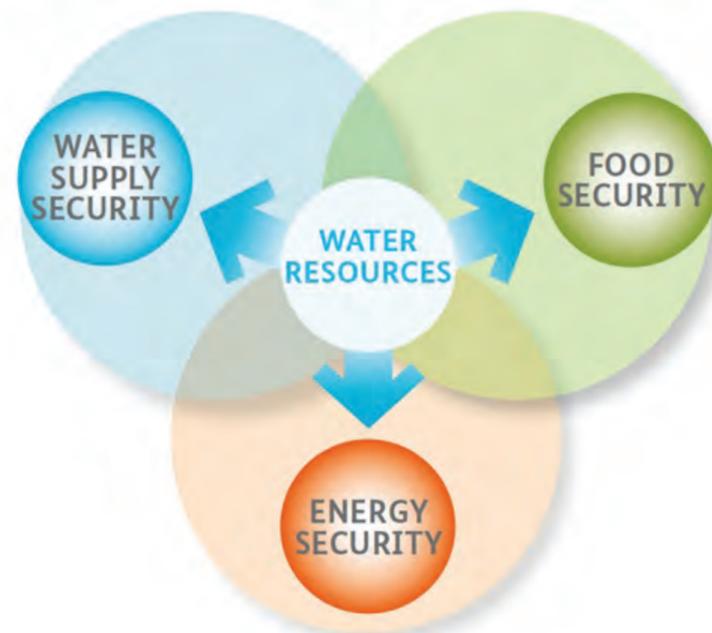
Since 2005, there have been 14 high volume (100,000 gallons of water or more) hydraulic fracturing operations in Michigan. The average volume of water used for those operations was 4.96 million gallons (source: MDEQ).

WATER & HYDRAULIC FRACTURING

99.5 percent of the hydraulic fracturing fluid is water, which is mixed with sand and a relatively small amount of chemical additives whose purpose is to ensure the effectiveness of the fracturing process.

Water Sources

With rare exception, most of the water used in oil and natural gas operations in Michigan comes from groundwater sources, which are plentiful and replenished naturally through rain, snow and the natural movement of groundwater. When large volumes of water are used by Michigan's oil and natural gas producers, they must be approved by the Michigan Department of Environmental Quality (MDEQ).



Water is integral to all aspects of our lives. Water used in hydraulic fracturing is strictly regulated to ensure that large water withdrawals are done safely to preserve healthy ground and surface water levels and reliant ecosystems. Michigan's oil and natural gas producers recognize the responsibility we have to use water resources wisely. Water used in hydraulic fracturing is strictly regulated to ensure that water withdrawals of 100,000 gallons or more can be done safely to preserve healthy ground and surface water levels and reliant ecosystems.

Michigan Hydraulic Fracturing Use*

50,000-80,000 gal. fracture →

100,000-1 million gal. fracture →

3 million-10 million gal. fracture →

20 million gal. fracture →

*one time

Comparable Michigan water uses*

Pickle Producer in Ottawa County
An RV park in Sanilac County

Irrigation of an 18 hole golf course in Sanilac County
Fruit grower and shipper in Leelanau County

Maintenance of a golf course in Washtenaw County
Thermoplastics producer in Livingston County

Preservation of a golf course in Livingston County
Brick manufacturer in Shiawassee County

*per annum (2012)

Source: Michigan DEQ

BY THE NUMBERS

6,000,000,000,000,000 gallons

Held in Michigan's five great lakes

4,000,000,000,000 gallons

Used by Michigan in 2012

159,000,000,000 gallons

Used by Wayne County (MI) in 2012

40,590,000 gallons

Used for hydraulic fracturing last year (2012)

Source: Michigan DEQ