

Three Mile Island Nuclear Generating Station

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"Three Mile Island" redirects here. For the 1979 accidental partial core meltdown, see [Three Mile Island accident](#). For other uses, see [Three Mile Island \(disambiguation\)](#).

Three Mile Island Nuclear Generating Station





The Three Mile Island NPP on Three Mile Island, circa 1979



[Wikimedia](#) | © [OpenStreetMap](#)

Country United States

Location [Londonderry Township, Dauphin County, Pennsylvania](#)

Coordinates	 40°9′14″N 76°43′29″W﻿ / ﻿Coordinates﻿ / ﻿
	40°9′14″N 76°43′29″W
Status	Being decommissioned
Construction began	Unit 1: May 18, 1968 Unit 2: November 1, 1969
<u>Commission date</u>	Unit 1: September 2, 1974 Unit 2: December 30, 1978
Decommission date	Unit 1: September 20, 2019 Unit 2: March 28, 1979
Construction cost	\$1.557 billion (2007 USD) ^[1] (\$2.00 billion in 2019 dollars ^[2])
Owner(s)	Unit 1: Exelon Unit 2: FirstEnergy
Operator(s)	Exelon Nuclear
Nuclear power station	
Reactor type	PWR
Reactor supplier	Babcock & Wilcox
Cooling towers	4 × Natural Draft
Cooling source	Susquehanna River
Thermal capacity	1 × 2568 MW _{th}
Power generation	
Units operational	1 × 819 MW
Make and model	B&W LLP (DRYAMB)
Units decommissioned	1 × 880 MW
<u>Nameplate capacity</u>	819 MW
<u>Capacity factor</u>	95.65% (2017) 73.25% (lifetime)

Annual net output	6862 GWh (2017)
External links	
Website	 Three Mile Island
Commons	 Related media on Commons
[edit on Wikidata]	

Three Mile Island Nuclear Generating Station (TMI) is a closed [nuclear power plant](#) on Three Mile Island in [Londonderry Township, Pennsylvania](#), on the [Susquehanna River](#) just south of [Harrisburg](#). It had two separate units, TMI-1 (owned by Exelon Generation) and TMI-2 (owned by FirstEnergy Corp).^[3] The plant was the site of the [most significant accident in United States commercial nuclear energy](#) when, on March 28, 1979, TMI-2 suffered a partial [meltdown](#). According to the [Nuclear Regulatory Commission](#) (NRC) report, the accident resulted in no deaths or injuries to plant workers or in nearby communities.^[4] Follow-up [epidemiology](#) studies have linked no incidents of cancer to the accident.^{[5][6][7][8]}

The [reactor core](#) of TMI-2 has since been removed from the site, but the site has not been decommissioned.^[9] In July 1998, Amergen Energy (now [Exelon](#) Generation) agreed to purchase TMI-1 from General Public Utilities for \$100 million.^[10]

Three Mile Island is so named because it is located three miles downriver from [Middletown, Pennsylvania](#).^[11] The plant was originally built by [General Public Utilities Corporation](#), later renamed GPU Incorporated.^[12] The plant was operated by [Metropolitan Edison Company](#) (Met-Ed), a subsidiary of the GPU Energy division. During 2001, GPU Inc. merged with [FirstEnergy Corporation](#).^[13]

Exelon was operating Unit 1 at Three Mile Island at a loss since 2015.^[14] In 2017 the company said it would consider ceasing operations at Unit 1 because of high costs unless there was government action;^{[further explanation needed][15][16]} it shut down in 2019.^[17]

Unit 2, which has been dormant since the accident in 1979, is still owned by FirstEnergy, and it is estimated to close in 2037.^[18]



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Emergency zones and nearby population^{[\[edit\]](#)}

The NRC defines two emergency planning zones around nuclear power plants: a plume exposure pathway zone with a radius of 10 miles (16 km), concerned primarily with exposure to, and inhalation of, airborne [radioactive contamination](#), and an ingestion pathway zone of about 50 miles (80 km), concerned primarily with ingestion of food and liquid contaminated by radioactivity.^{[\[19\]](#)}

The 2010 U.S. population within 10 miles (16 km) of Three Mile Island was 211,261, an increase of 10.9 percent in a decade, according to an analysis of U.S. Census data for [MSNBC](#). The 2010 U.S. population within 50 miles (80 km) was 2,803,322, an increase of 10.3 percent since 2000. Cities within 50 miles include Harrisburg (12 miles to city center), York (13 miles to city center), and Lancaster (24 miles to city center).^{[\[20\]](#)}

Three Mile Island Unit 1^{[\[edit\]](#)}

The **Three Mile Island Unit 1** is a [pressurized water reactor](#) designed by [Babcock & Wilcox](#) with a net generating capacity of 819 [MW_e](#). The initial construction cost for TMI-1 was US\$400 million, equal to \$2.07 billion in 2018 dollars.^{[\[21\]](#)} Unit 1 first came online on April 19, 1974, and began commercial operations on September 2, 1974.^{[\[22\]](#)} TMI-1 is licensed to operate for 40 years from its first run, and in 2009, was extended 20 years, which means it could have operated until April 19, 2034.^{[\[23\]](#)[\[24\]](#)}

TMI-1 had a closed-cycle cooling system for its main condenser using two natural draft cooling towers. Makeup water was drawn from the river to replace the water lost via evaporation in the towers. Once-through cooling with river water is used for the service water system which cools auxiliary components and removed decay heat when the reactor was shut down. When TMI-2 suffered its accident in 1979, TMI-1 was offline for refueling. It was brought back online in October 1985, after public opposition, several federal court injunctions, and some technical and regulatory complications.^{[\[25\]](#)}



September 2019 photo of Three Mile Island and Goldsboro, PA

Unit 1 was scheduled to be shut down by September 2019 after Exelon announced they did not receive any commitments for subsidies from the state, rendering Exelon unable to continue operating the reactor.^{[26][27]} TMI-1 was shut down on September 20, 2019.^[28]

Incidents^[edit]

In February 1993, a man drove his car past a checkpoint at the TMI nuclear plant, then broke through an entry gate. He eventually crashed the car through a secure door and entered the Unit 1 turbine building. The intruder, who had a history of mental illness, hid in the turbine building and was apprehended after four hours.^[29]



Three Mile Island from [Goldsboro, Pennsylvania](#) in 2013



Three Mile Island from [Middletown, Pennsylvania](#) in 2014



September 2019 photo of Three Mile Island and the Exelon training center and simulator building (left).

On November 21, 2009, a release of radioactivity occurred inside the containment building of TMI-1 while workers were cutting pipes. Exelon Corporation stated to the public that "A monitor at the temporary opening cut into the containment building wall to allow the new steam generators to be moved inside showed a slight increase in a reading and then returned to normal. Approximately 20 employees were treated for mild radiation exposure."^[30] As of November 22, 2009, it was believed that no radiation escaped the containment building and the public was not in any danger.^[citation needed] The inside airborne contamination was caused by a change in air pressure inside the containment building that dislodged small irradiated particles in the reactor piping system. Some of the small particles became airborne inside the building and were detected by an array of monitors in place to detect such material. The air pressure change occurred when inside building ventilation fans were started to support outage activities. The site modified the ventilation system to prevent future air pressure changes. Work continued on the project the following day. On January 24, 2010, TMI-1 was brought back online.^[31]



June 2010 Photo of Three Mile Island nuclear power plant with deactivated Unit 2 located on the left.

Three Mile Island Unit 2^[edit]



A rare image of both units one and two in operation for the few months that they were. It is estimated that this photo was taken in February 1979.



Unit 2 during its time in operation, viewed from the west

The **Three Mile Island Unit 2** was also a pressurized water reactor constructed by B&W, similar to Unit 1. The only difference was that TMI-2 was slightly larger with a net generating capacity of 906 MW_e, compared to TMI-1, which delivers 819 MW_e. Unit 2 received its operating license on February 8, 1978, and began commercial operation on December 30, 1978. TMI Unit 2 has been permanently shut off after the Three Mile Island accident in 1979.^[32]

Accident^[edit]



[Three Mile Island](#) in background behind [Harrisburg International Airport](#), a few weeks after the accident

Main article: [Three Mile Island accident](#)

On March 28, 1979, there was a [cooling system](#) malfunction that caused a partial [meltdown](#) of the [reactor core](#). This [loss-of-coolant accident](#) resulted in the release of an amount of [radioactivity](#), estimated at 43,000 [curies](#) (1.59 [PBq](#)) of radioactive [krypton](#)-85 gas (half life 10 yrs), but less than 20 curies (740 GBq) of the especially hazardous [iodine-131](#) (half life 8 days), into the surrounding environment.^[4]

Nearly 2 million people were exposed to a small amount of radiation from the accident.^[33] A review by the [World Nuclear Association](#) concluded that no deaths, injuries or adverse health effects resulted from the accident,^[34] and a report by Columbia University epidemiologist Maureen Hatch confirmed this finding.^{[5][35]} Because of the health concerns, the Pennsylvania Department of Health kept a registry of more than 30,000 people that lived within 5 miles of TMI at the time of the accident. The registry was kept for nearly 20 years until 1997, when no evidence was found of unusual health effects.^[36] Further [epidemiology](#) studies have not shown any increase in cancer as a result of the accident.^{[6][7][8]} However, almost \$25 million was paid in insurance

settlements to people who then agreed not to discuss their injuries in ongoing litigation.^[37]

Unit 2 has not been operational since the accident occurred.^[38]

The New York Times reported on August 14, 1993, 14 years after the accident, that the cleanup had been finished. According to the United States NRC, 2.3 million gallons of waste water had been removed.^[39]

The incident was widely publicized internationally, and had far-reaching effects on public opinion, particularly in the United States. [The China Syndrome](#), a movie about a nuclear disaster, which was released 12 days before the incident and received a glowing reception from the movie-going public, became a blockbuster hit.^[40]

Unit 2 Generator^[edit]

On January 22, 2010, officials at the NRC announced the electrical generator from the damaged Unit 2 reactor at TMI will be used at [Shearon Harris Nuclear Plant](#) in New Hill, North Carolina. The generator was transported in two parts, weighing a combined 670 tons. It was refurbished and installed during a refueling outage at Shearon Harris NPP in November 2010. TMI's Unit 2 reactor has been shut down since the partial meltdown in 1979.^[41]

Post-accident^[edit]

[Exelon Corporation](#) was created in October 2000 by the merger of PECO Energy Company and Unicom, of [Philadelphia](#) and Chicago respectively.^[42] Unicom owned [Commonwealth Edison](#). The PECO share in AmerGen was acquired by Exelon during late 2000. Exelon acquired British Energy's share in AmerGen in 2003,^[43] and transferred Unit 1 under the direct ownership and operation of its Exelon Nuclear business unit.^{[44][45]} According to Exelon Corporation, "many people are surprised when they learn that Three Mile Island is still making electricity, enough to power 800,000 households" from its undamaged and fully functional reactor unit 1.^[46] Exelon viewed the plant's economics of \$44/MWh as challenging due to the low price of natural gas at \$25/MWh. As of 2016, the average price of electricity in the area was \$39/MWh.^[47]

Closure^[edit]



Aerial view

On June 20, 2017, Exelon Generation, the owners of Three Mile Island's Unit 1 sent to the Nuclear Regulatory Commission a formal notice of its intention to shut down the plant on September 30, 2019,^[48] unless the Pennsylvania legislature rescues the nuclear industry, which is as of 2017 struggling to compete as newfound natural gas resources have driven down electricity prices.^[49] Exelon Generation's Senior Vice President Bryan Hanson noted that once Three Mile Island was closed, it could never be reopened for use again.^[48] Hanson explicitly stated the reason for the shutdown is because of the unprofitability of Unit 1. Unit 1 has lost the company over 300 million dollars over the last half-decade despite it being one of Exelon's best-performing power plants.

Shut down of Unit 1 can go in two possible directions, the first being the immediate dismantlement immediately after the radioactive fuel has been moved away from the plant. The dismantlement can proceed after the spent fuel is removed from the pool, put into storage casks, and the casks are transferred to the ISFSI pad for storage until the DOE takes them away to a DOE repository. Dismantling the plant this way will take anywhere from 8 to 10 years.^[50] The second option Exelon could take is the long-term storage, which involves mothballing the plant and letting the radiation decay for up to 60 years on its own to a harmless level before completely dismantling the buildings. The advantage to the long-term storage is the lack of radiation when the dismantlement would begin but the disadvantage would be the possible lack of qualified workers at the time of dismantlement. Exelon would also have to pay for limited maintenance and security of the plant over the potential sixty years.^[50] The entirety of the spent fuel will be moved to the Londonderry Township facility, which is another process that could take decades to complete.^[48]



About 70 state legislators signed the industry-inspired Nuclear Caucus but made no financial commitments.^[49]

In April 2019, Exelon stated it would cost \$1.2 billion over nearly 60 years to completely decommission Unit 1.^[51] Unit 1 closed on September 20, 2019.

Seismic risk^[edit]

The Nuclear Regulatory Commission's estimate of the risk each year of an earthquake intense enough to cause core damage to the reactor at Three Mile Island was 1 in 25,000, according to an NRC study published in August 2010.^{[52][53]}

See also^[edit]

-  [Pennsylvania portal](#)
-  [Energy portal](#)
-  [Nuclear technology portal](#)
- [Chernobyl disaster](#)

- [Fukushima Daiichi nuclear disaster](#)

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