GPU Nuclear

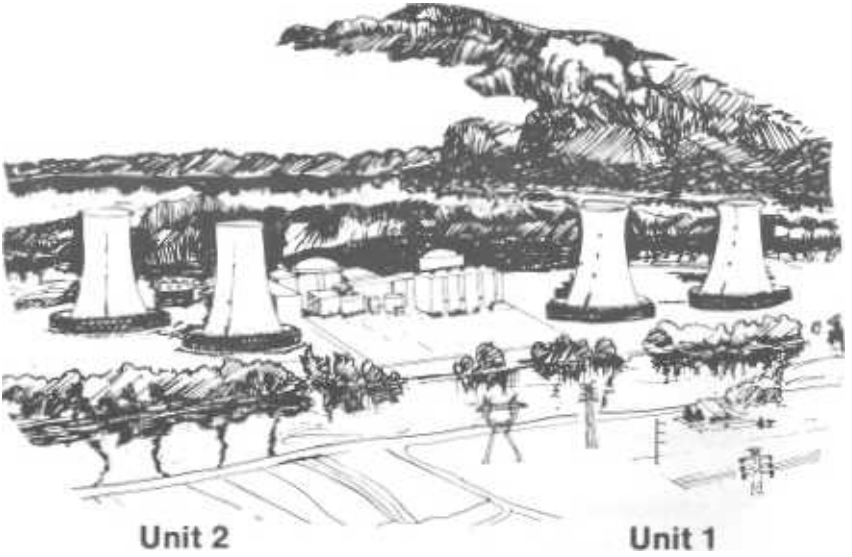
Three Mile Island

TMI Facts & Figures

LOCATION

Three Mile Island, in the Susquehanna River, Londonderry Township, Dauphin County, about 10 miles south of Harrisburg, Pennsylvania.

FACILITIES



TMI Nuclear Unit 1, with a capacity of about 800 megawatts, placed in operation in September, 1974:

- -Commercial operation - September 2, 1974
- -Reactor and related components supplied by Babcock and Wilcox
- -Turbine-Generator supplied by General Electric
- -Architect-Engineer- Gilbert Associates Inc.
- -Total cost of Unit 1 was $400 million

TMI Nuclear Unit 2, dedicated September 19, 1978, with a capacity of about 900 megawatts:

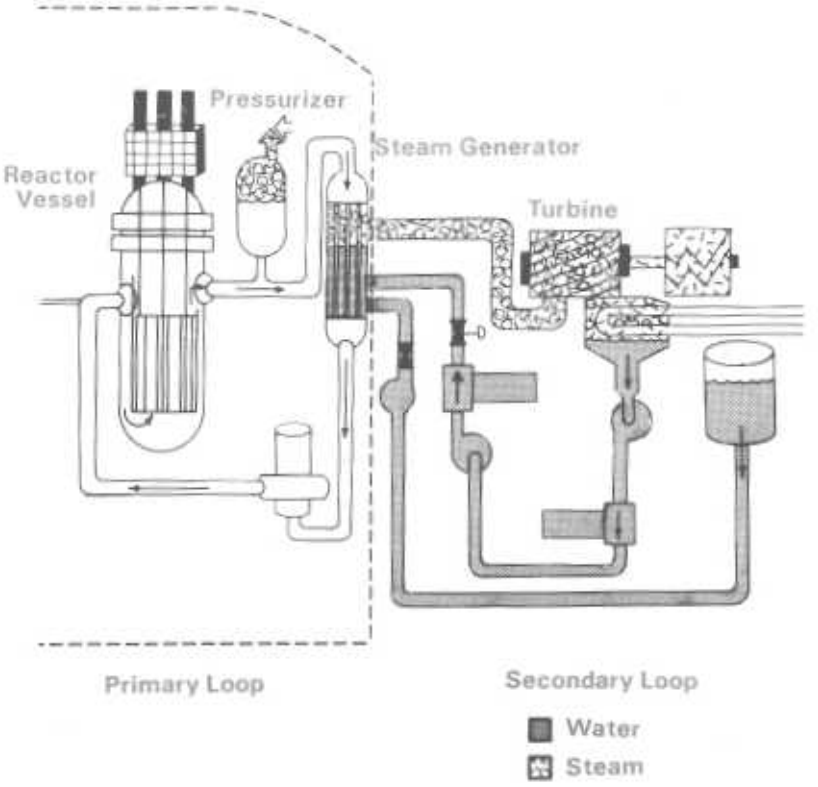
- -Commercial operation - December 30, 1978
- -Reactor and related components supplied by Babcock and Wilcox
- -Turbine-Generator supplied by Westinghouse
- -Architect-Engineer- Burns and Roe
- -Total cost of Unit 2 was $700 million

TMI REACTORS

Both TMI Unit 1 and Unit 2 are light water reactors (LWR). LWRs are so called because ordinary water is used as the coolant or medium to transfer heat.

There are two types of LWR, a Boiling Water Reactor (BWR), and a Pressurized Water Reactor (PWR). In BWRs the water boils to steam directly in the reactor vessel. In PWRs the reactor water is pressurized so as not to boil. Instead it is pumped through a steam generator, also known as a heat exchanger, where a separate supply of water is heated to produce steam.

Both TMI Unit 1 and Unit 2 are PWRs.



It took six years to construct TMI Unit 1.

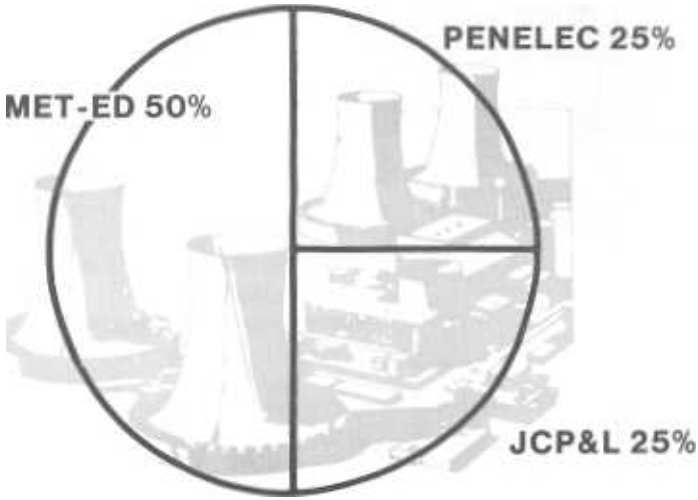
It took almost nine years to construct TMI Unit 2.

Unit 2 contains
-190,000 cubic yards of concrete
-24,000 tons of steel (reinforcing and structural)
-740 miles of electrical wiring

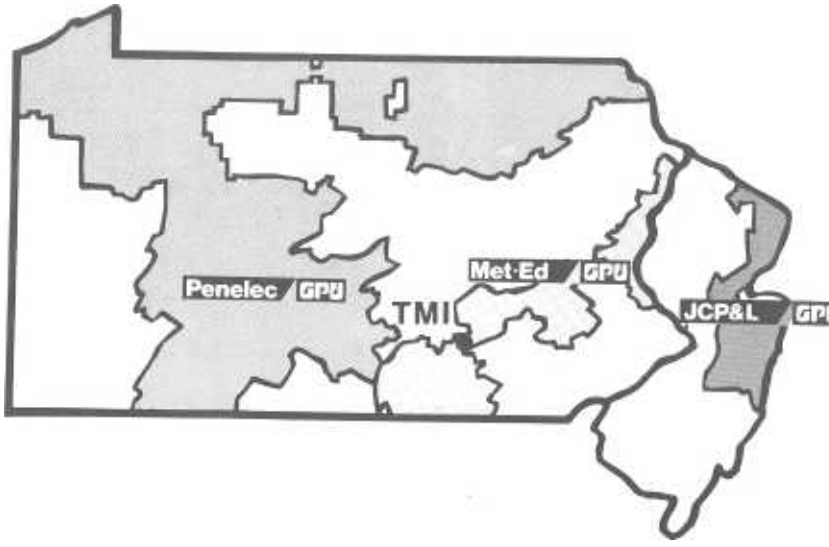
Comparable amounts of materials were used to construct TMI Unit 1.

OWNERSHIP

TMI Nuclear Generating Station is owned jointly by the three operating companies of the General Public Utilities Corporation (GPU): Jersey Central Power and Light Company (JCP&L), 25 percent; Metropolitan Edison Company (Met-Ed), 50 percent, and Pennsylvania Electric Company (Penelec), 25 percent.



The GPU companies serve about 1.5 million customers over half the land area of Pennsylvania and New Jersey.



GPU is a utility holding company, formed under the Public Utility Holding Company Act of 1935. GPU is the 18th largest investor-owned electric utility system in the United States, in terms of total assets.

GENERATING CAPACITY

The two TMI operating Units would have a combined capacity of about 1,700 megawatts.

This is enough electricity to supply nearly one and a quarter million homes.

EMPLOYMENT

Some 9,500 man-years of craft labor were required to construct TMI Unit 2; another 8,500 man-years went into TM I Unit 1 -a total of 18,000 man-years of craft employment to bring the TMI Station to full-scale operation.

The number of employees at the TMI Nuclear Station has varied from about 1,000 to 2,400 people.

TMI Units land 2 are operated forth e GPU System companies by GPU Nuclear.

INVESTMENT

The GPU System has invested more than $1.1 billion on Three Mile Island, excluding nuclear fuel.

FUEL QUANTITIES

TMI-1 use of uranium for one day's operation is 6.07 pounds.

-Equivalent in standard barrels of oil for one day is 36,420
-Equivalent in tons of coal for one day is 7,760

TMI-2, in operation, would use 6.88 pounds of uranium for one day's operation.

-Equivalent in standard barrels of oil for one day would be 41,280 barrels.
-Equivalent in tons of coal for one day would be 8,800.

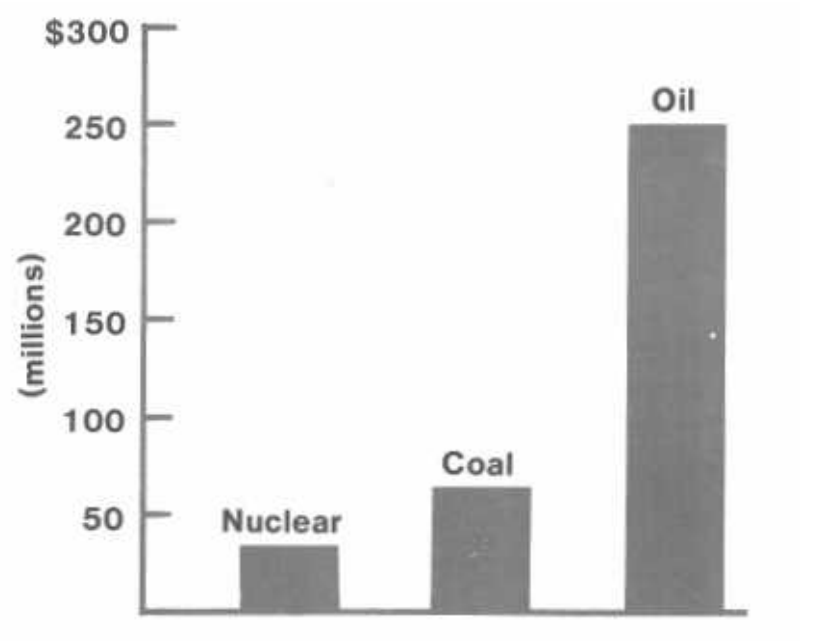
ENERGY COSTS

Nuclear fuel is the cheapest fuel available in the GPU service area for the large-scale generation of electricity.

The annual fuel cost at TMI Nuclear Station would be about $27 million if both units were in service

-If coal were burned instead of using nuclear fission , the fuel cost would be $60 million.
-With oil, it would be $250 million.

The fuel cost savings from the use of nuclear energy is passed on to customers through lower energy adjustment charges.



RADIATION LEVELS

Similar quantities of radiation from a nuclear power plant are identical in physical behavior and in the effect on people to similar quantities of naturally occurring radiation.

". . . from routine operation of all commercial nuclear power plants and all the facilities in their fuel cycle, the calculated average annual dose to an individual in the domestic population today is about 1 /3 of one millirem."

"Radiation: Measure for Measure," Atomic Industrial Forum, 1981

COMPUTE YOUR RADIATION DOSE*

We live in a radioactive world. Radiation is all about us and is part of our natural environment. By filling in the blanks on this form, you will get an idea of your annual exposure to radiation.

	Common Sources of Radiation		Your Annual Dose (mrem's)
WHERE YOU LIVE	**Location:** Cosmic radiation at ***sea level*** . . .		44
	Elevation: Add 1 mrem for each 100 feet of elevation.		
	Elevation of some U.S. cities (in feet): Atlanta 1050; Chicago 595; Dallas 435; Denver 5280; Las Vegas 2000; Minneapolis 815; Pittsburgh 1200; St. Louis 455; Salt Lake City 4400; Spokane 1890. (Coastal cities are assumed to be zero, or sea level.)		
	House Construction (based on 3/4 of time indoors)		____
	Brick	45	
	Stone	50	
	Wood	35	
	Concrete	45	
	Ground: (based on 1/4 time outdoors): U.S. Average		15
WHAT YOU EAT, DRINK, AND BREATHE	**Food** **Water** **Air**	**U.S. Average**	25
	Weapons test fallout		4

* *American Nuclear* Society, 1980

	Common Sources of Radiation	Your Annual Dose (mrem's)
HOW YOU LIVE	**X-ray diagnosis**	
	Number of Chest X-rays _____ x 10	_____
	Number of lower Gastrointestinal tract X-rays _____ x 500	_____
	U.S. Average Dose: Whole Body ____ 100	_____
	Jet plane travel: For each 1500 miles add 1 mrem	_____
	TV viewing: For each hour per day _____ X .15	_____
HOW CLOSE YOU LIVE TO A NUCLEAR PLANT	(based on 24 hours a day)	
	At site boundary: 4.8	_____
	One mile away: 48	_____
	Five miles away: 048	_____
	Over 5 miles away: . . . . . None	_____
	My total annual mrem's dose	_____

Compare your annual dose
to the U.S. annual average of 228 mrem's

One mrem per year is equal to:

Moving to an elevation 100 feet higher,
Increasing your diet by 4%,
Taking a 5-day vacation in the Sierra Nevada mountains.

THE TMI-1 RECORD

TMI, in the four years it has operated, generated 21 billion kilowatt-hours of electricity. That is enough to supply New York City for six months.

At the time of the accident in Unit 2, TMI-1 had a capacity factor since start-up-the percentage of rated capacity actually turned out-of 76 percent. This is well above the national average for nuclear-fueled electric generating plants.

A **NUCLEAR GLOSSARY**

ALPHA PARTICLE	A positively charged particle emitted by certain radioactive materials. Alpha particles can be stopped by a sheet of paper.
ATOM	The basic component of all matter; the smallest part of an element that has all the chemical properties of that element. Atoms are made up of protons, neutrons, and electrons.
BACKGROUND RADIATION	Radiation from natural sources (cosmic rays, rocks, and from minerals inside the body). Normal background radiation for Americans is about 100 to 200 millirem per year, with the higher figure occurring at higher altitudes.
BETA PARTICLE	A negatively charged particle emitted from an atom during radioactive decay. A beta particle is an electron that has a mass equal to 1/1837 that of a proton. A beta particle can be stopped by an inch of wood or a thin sheet of aluminum.
BOILING WATER REACTOR (BWR)	A nuclear reactor in which water is boiled in the core; the resulting steam drives a turbine to generate electricity.
BORATED WATER	Water with boron which acts as a neutron absorber and helps to control the rate of fission in a nuclear reactor
CHAIN REACTION	A self-sustaining series of events occurring when a neutron splits an atom releasing sufficient neutrons to cause many other atoms to split in the same way.

CLADDING — **The** outer covering, usually a zirconium alloy, of a nuclear fuel element. The cladding serves as a barrier by preventing the release of radioactivity into the coolant.

COLD SHUT-DOWN — Condition of a reactor when fission process has been halted and temperature in the core coolant has dropped below the boiling point of water.

CONDENSER — Apparatus where steam which turns the turbines is cooled, and condensed to liquid state for return to steam generator.

CONTAINMENT **BUILDING** — Steel and reinforced concrete structure housing the nuclear reactor and steam generator. The containment building is sometimes referred to as the reactor containment building and at some plants as the containment vessel. It should not be confused with reactor vessel, defined on page 17.

CONTAMINATION — Dispersed radioactive material in a location where it is not wanted.

CONTROL ROD — A rod containing materials such as silver, cadmium, and indium, which controls the power of the reactor. By absorbing neutrons, a control rod, when dropped into the fuel core, halts the chain reaction by which the reactor generates heat.

COOLANT — Liquid or gas circulated through a nuclear reactor to remove or transfer heat. Some coolants are water, heavy water, carbon dioxide, liquid sodium, and sodium-potassium alloy.

COOLING TOWER The structure where hot water in condenser tubes is circulated for cooling and then returned to the condenser. Cooling towers are now common to most power plants, whether they use coal, oil or nuclear fuel to make steam. The four cooling towers at TMI are identical. Each is 372 feet high. When the units are operating at full power, 200,000 gallons of water per minute pass through each tower. The evaporative plume or cloud of water vapor varies from 3,000 to 5,000 gallons per minute. The water vapor from the cooling tower is NOT contaminated.

COOLING WATER LOOP The portion of the plant system that transfers the heat in the secondary loop to the atmosphere (cooling towers) without the water in the two loops touching.

CORE The part of a nuclear reactor containing the fuel assemblies which generate heat by fission.

CRITICALITY The point at which a nuclear reactor is just capable of sustaining a chain reaction.

CRITICAL MASS The smallest amount of fuel necessary to sustain a chain reaction.

CURIE A measure of radiation being produced by radioactive materials. A curie represents a decay rate among fission products of 37 billion radiation emissions every second. It is often more convenient to use fractions of a curie: subunits like millicuries (one thousandth of a curie) or microcurie (one millionth of a curie) or even picocuries (one thousandth of a billionth of a curie).

DECAY HEAT The heat produced from the decay of radioactive atoms in a reactor. This process continues AFTER the reactor has been shut down.

DOSIMETER A device, such as a film badge, which can be worn and is used to measure the radiation dosage a person receives over a period of time.

ELECTRON A subatomic particle with a negative electric charge and a mass 1/1837 that of a proton.

EMERGENCY CORE COOLING SYSTEM A series of backup safety systems designed to dump thousands of gallons of cooling water into the reactor in the event the normal core cooling system fails.

ENRICHED FUEL Uranium which has been modified by increasing the concentration of the fissionable isotope, uranium-235. Enriched fuel is more able to sustain a chain reaction and slightly enriched fuel is normally used as the fuel for a nuclear power plant.

FISSION The splitting or breaking apart of a heavy atom into two new atoms. When a heavy atom, such as uranium, is split, large amounts of energy and one or more neutrons are released.

FISSION PRODUCTS The atoms formed when uranium is split in a nuclear reactor. Fission products are usually radioactive.

FUEL ASSEMBLIES Separate bundles of fuel rods. TMI Unit 1 reactor contains 177 fuel assemblies with 36,816 fuel rods. Of the 177 fuel assemblies, 69 contain control rods.

FUEL RODS Long, hollow rods, usually of a zirconium alloy, into which are stacked 200 to 240 pellets of uranium, each of which is approximately .6 inch long. The number of pellets is determined by the design of the reactor.

GAMMA **RAYS** Penetrating electromagnetic radiation emitted in radioactive decay, similar to X-ray radiation.

HALF-LIFE Term used to describe the time rate at which half of a given quantity of a radioactive material decays into stable element(s).

HEAT EXCHANGER A device which transfers heat from one material, such as water or gas, to another substance with no direct contact between the two materials.

ISOTOPE Different forms of the same chemical element which are distinguished by having different numbers of neutrons in the nucleus. A single element may have many isotopes. For example, the three isotopes of hydrogen are protium, deuterium, and tritium.

LOOP A system of piping and components (pumps, condenser, valves, etc.) through which coolant passes.

MELTDOWN The overheating of a reactor core, usually as a result of loss of coolant, to the extent that the uranium fuel in the fuel rod melts.

MILLIREM A measure of radiation. A millirem is one-thousandth of a rem (Roentgen), the basic measure of radiation. The annual average radiation exposure for U.S. residents is 228 millirem.

NUCLEAR REACTOR The device in which a fission chain reaction can be initiated, maintained and controlled. Heat from the fission process is used to make steam to turn generators for producing electricity.

NEUTRON An uncharged particle with a mass nearly equal to the mass of a proton. Neutrons are the particles which sustain a chain reaction in a nuclear reactor.

NUCLEUS Core or center of an atom containing protons and/or neutrons. Although the nucleus is only about 1 /10,000 of the diameter of an atom, it contains nearly all the mass of an atom.

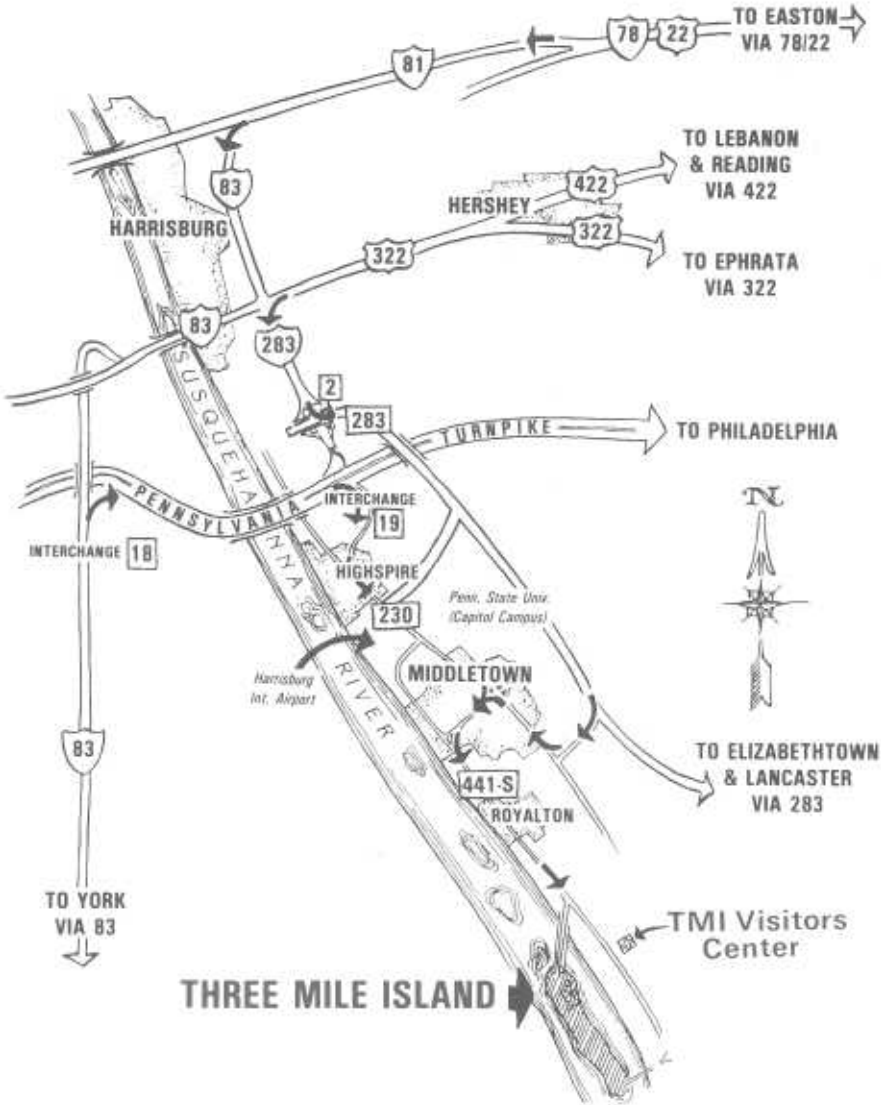
PRESSURIZED WATER REACTOR The most common type of commercial nuclear reactor in the United States. Coolant in the primary loop is kept under pressure to prevent its boiling. TMI Units 1 and 2 are pressurized water reactors.

PRESSURIZER Vessel designed to control pressure in the reactor vessel and main coolant system.

PRIMARY LOOP The loop through which the reactor coolant circulates. Coolant is heated in the reactor and then pumped under pressure to the steam generator, or heat exchanger. There, the water in the secondary loop is flashed into steam, which turns the turbine.

PROTON A subatomic particle with a positive electric charge, and a mass 1,837 times that of an electron.

RADIATION	The emission of some form of energy in the form of a particle or a ray from an object. This energy which is emitted or radiated is then absorbed in the medium or substance which surrounds the object.
REACTOR VESSEL	Steel-walled (8 to 10 inches thick) container housing the reactor fuel core and control rods.
RELIEF VALVE	A valve designed to lift or open at a designated pressure to reduce excess pressure in the system.
SECONDARY LOOP	The loop through which steam circulates from steam generators to turbines, then through condenser and back in the form of water to the steam generator.
STEAM GENERATOR	A piece of equipment within which heat is transferred from the primary loop to the secondary loop without the water of the two systems actually touching.
TURBINE	The device which converts the heat energy in steam into electrical energy.



Three Mile Island Nuclear Generating Station
Visitors Center
Route 441
Middletown, Pennsylvania

The Visitors Center is open to the public seven days a week, from 10:00 A.M. to 5:00 P. M. For information about arranging a tour of Three Mile Island for your group, call (717) 944-0303 or (717) 367-0518.