



Southern California Edison Backgrounder

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Fueling Nuclear Power

The reason the operation of nuclear power plants like Southern California Edison's (SCE's) San Onofre Nuclear Generating Station creates no greenhouse gas emissions is they do not burn fossil fuels. Instead, they create the heat needed to produce steam and drive generator turbines through a process called fission – splitting uranium atoms. Uranium is one of the world's most abundant metals. Its density makes it an excellent source of this concentrated energy.

North America has abundant supplies of secure, domestic uranium. Additionally, stable international markets are available including suppliers such as Canada and Australia. As a result, nuclear generation provides an important means of making the U.S. electricity supply less dependent on fuels from less stable parts of the world. SCE works to maintain a reliable, low-cost nuclear fuel supply from a diverse mixture of suppliers.

Creating Nuclear Fuel

Uranium undergoes four processing steps as it becomes fuel for nuclear power plants:



Step 1. Uranium is mined much like any mineral found in the earth's surface. Solvents remove the uranium from the mined ore. The resulting uranium oxide, called yellowcake, then undergoes filtering and drying.

Step 2. A chemical process converts the yellowcake to uranium hexafluoride which is heated to become a gas and loaded into cylinders where it cools into a solid.

Step 3. Uranium hexafluoride contains two types of uranium, U-238 and U-235, the latter serving as the source of the fission that occurs in nuclear reactors. At this stage, the percentage of U-235 is less than 1 percent and must be "enriched" to between 3 and 5 percent to be usable as fuel. At this level of enrichment an explosion is impossible.

Step 4. Finally, the uranium hexafluoride is converted into uranium dioxide powder, pressed into fuel pellets and loaded into long tubes. Once grouped together into a bundle, these tubes form a fuel assembly ready for use as nuclear plant fuel.

A Little of this Fuel Goes a Long Way

A uranium fuel pellet the size of a fingertip contains as much energy as 17,000 cubic feet of natural gas, 1,780 pounds of coal or 149 gallons of oil.

As a result, all the used nuclear fuel produced by the U.S. nuclear energy industry in four decades of commercial operation would, if stacked end to end, cover an area the size of just one football field to a depth of less than 10 yards.



Every 18 to 24 months, each reactor of a nuclear plant is shut down for refueling outages of about a month, during which the oldest fuel assemblies are replaced.



Safe Used Fuel Storage

- Used fuel is a solid material that is being stored safely at nuclear power plant sites such as San Onofre either in steel-lined, concrete pools or sealed, steel-reinforced, concrete containers with steel inner canisters.

- The Nuclear Regulatory Commission (NRC) has determined that used fuel could be stored safely in such canisters for at least 100 years. Industry methods of monitoring and maintenance of safety systems ensure public health and safety.

- Advanced technologies, such as those proposed under the Department of Energy's (DOE's) Global Nuclear Energy Partnership initiative, are being developed to reprocess and recycle used nuclear fuel. If successful, these technologies would reduce the amount of radioactive byproducts in the material, while recovering valuable energy. France, Britain, Japan, and other countries have safely reprocessed nuclear fuel for years.

- Under any used fuel management program, disposal of radioactive byproducts in a permanent geologic repository is necessary.



Congress and the president approved a site in 2002 for a federal repository. In 2008, the DOE submitted a license application to the NRC for the construction and operation of the repository. Once approved, DOE will construct and begin operating the facility.